THE ELECTRICAL WORLD

A Weekly Review of Current Progress in Electricity

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THE Western Union can gain nothing by its policy of ruthlessly destroying rival companies' lines, except it be the further ill-will of the community. The choosing of such a day as Christmas, when no courts are in session to prevent it by injunction, was, of course necessary; but proceedings, we understand, will be commenced to bring the prime movers and participators to justice, and we sincerely hope that they will be punished. There has been too much of this high-handed procedure.

IT is some time since the announcement was made that the refining of sugar had been successfully accomplished in this city; but of late little has been heard of the project. However, our article in another column shows that considerable attention has been devoted to the subject abroad with encouraging results. Although it would be premature to say that the entire refining process can be accomplished electrically, it would nevertheless appear as established that at certain stages of the operation electricity can be profitably applied. If to the electrolytic purifying action we add the power of ozone generated by electricity, to decolorize the sugary solutions, we may find it effective means which, to our knowledge, have not yet been tried in combination.

IN one of his current Lowell Institute lectures, Mr. Thos. D. Lockwood gives some interesting figures in regard to telephonic industry and invention. The growth of the telephone is shown in the fact stated by him that, in August, 1877, the number of instruments in use in this country was only 780, while in February, 1880, there was 60,800; 249,700 in 1883, 307,010 in 1884, and in February, 1885, 325,574. There are about 18,000 in Canada, and 13,000 in Great Britain. The number of exchanges has grown from 100 in 1880 to 782 in 1885. In January of the present year there were 137,223 miles of telephone wire in this country. There are 5,168 persons furnished employment by the exchanges. More different patents have been issued on the telephone than in any other single line of invention in the country. The total number for the 10 years is 1,521. These figures compiled by Mr. Lockwood are remarkable, but they justify him in his opinion that the telephone is only at the beginning of its career of usefulness.

OUR recent remarks in reference to the advisability of the establishment of a bureau of electrical engineering in our navy department are confirmed in the recent action of the British admiralty, who have instructed their officers to report as to their opinion on the present method of dealing with the internal electric lighting of ships. The officers are desired to state whether they consider that the contracts for the installation of the electric light into Her Majesty's vessels should continue to be given to private firms, or whether, on the other hand, it is desirable that all such work should be carried out by dockyard employés. If it is their opinion that the work should be done in the dockyards, they are to state what staff of officers and artificers will be required for the work. It is considered unlikely that the dockyard officers will reply that they are unable to carry out the work, and therefore there is every reasonable prospect of the work being in future entirely carried out at the various naval establishments. This need not entail any hardships upon private enterprise, which would still be called upon to furnish all the material required. But, on the other hand, it would greatly strengthen a navy department to have men capable of looking after the electrical work on shipboard. We again commend this subject to the attention of the powers that be.

THE recent increase in salary voted the professors at Cornell draws attention to the meagreness of the remuneration of the professors in most of our colleges. It is truly sad to see professors eking out a meagre existence on these small salaries, which are the root of considerable evil. With the present state of affairs it cannot be wondered at that professors seek to increase their income by taking in outside work, foreign to the institutions which they serve. This necessarily means so much time taken away from the students. A professor endowed with a liberal salary will have no desire to encumber himself with outside work, and hence all his energies will be devoted to the furtherance of education. Besides, too liberal a salary cannot be offered to a man who imparts his hard-earned knowledge for the benefit of his fellow men, and without liberal compensation and endowment original investigation must come to a standstill. What we have said applies especially to our younger technical colleges, in which the evils we have hinted at are known to exist to a considerable degree. There can, of course, be no objection to professors taking in as much outside work as they choose, but they certainly should not, as at present, be made dependent upon it, and when once the cause is removed, we may safely say the practice will fall into desuetude.

WHAT we have predicted in reference to M. Deprez's experiments has happened. It will be remembered that in a recent issue we expressed serious doubts whether such high electromotive force as M. Deprez employs (6000 volts and over) would not prove too much for the insulation of the machines. That we were correct is shown by an accident, if it may be called so, which has already taken place, and which resulted in the burning out of the machine. Recently again a large gathering of scientists and representative men had been invited to witness M. Deprez's installation at Creil, when suddenly a succession of brilliant sparks at the brushes of the machine was followed by complete stoppage. From what can be learned of the nature of the latter accident, it would appear to be due to the static discharge of the line. The latter consists of a silicium bronze wire, insulated and covered with lead, thus constituting a condenser. Being placed near a telegraph wire at a certain spot, a discharge took place, which stopped the machines and burnt out the telegraph instruments. This is another result of the employment of high E. M. F., at least with this form of conductor, which may, however, be avoided by suitably grounding the lead sheath of the line, provided this can be done without carrying off any current through defective insulation. M. Deprez has still to demonstrate that he can transmit 100 horse-power continuously over his line with economy, and this is the problem which he has set out to solve.

A CORRESPONDENT of the London *Times* draws attention to the awkward position in which England would find herself in case of a war with another power, as regards cable communication. He points out that cables are so recent that international law has not yet taken cognizance of them, and even the last telegraph convention adopted an article providing that "the stipulations of the present convention do not in any way restrict the freedom of action of belligerents." In case of war, cable cutting would undoubtedly be resorted to; but the point which the *Times* correspondent would bring out is, that very few of the English cables land on soil other than British. Hence, a belligerent power would, in cutting a cable, come in no conflict with a neutral one. Suppose "England and France are at war. Dispatches for Halifax and Jamaica are contraband. Has France the right, assuming she has the power, to cut the Atlantic cables? To do so would be an almost intolerable nuisance to the United States and would *paralyze the business of New York.*" There can be no doubt that such an occurrence would create enormous inconvenience, but as regards the stroke of total paralysis which would fall upon New York, it only exists in the mind of the excited Briton. The question itself is, however, a serious one, but we really fail to see in what way a satisfactory solution could be arrived at. It is safe to say that in time of war cables would be cut without regard to law or stipulations, and that it would be next to impossible to detect the offender. These things occur in times of international peace, though of *war* between rival cable companies, but we hardly ever hear of the discovery, much less the bringing to justice, of the guilty parties.

AT the beginning of last year, we added a cover to THE ELECTRICAL WORLD, making it a twenty page paper. During the year we have frequently had occasion to make it twenty-four and twenty-eight pages, but our present issue again reaches higher mark, being no less than thirty pages. Even in that space we find it difficult to allot room for all the advertising that crowds in upon the columns. Such an issue is one that we cannot but take pride in, evidencing as it does not only the activity in the business that it has been our aim to advocate, protect and promote, but the desire of all the enterprising concerns in it to make their New Year announcements through the medium of the leading and representative journal. With such an exhibition of the well-grounded faith of advertisers in the merits of the paper, we need say nothing as to the benefits of advertising in it, but we take the opportunity to point out to those who may not read it regularly, that if they have the slightest interest of any kind in the great advancing science of electricity or any of its practical applications, it is impossible for them to keep fully informed on all that is going on without a systematic perusal of its pages. The price of the paper—barely six cents a week—is the merest trifle, but in return for that small sum, and at an expense of thousands of dollars for every dollar of each subscription, we give all the electrical news of importance, whether scientific, commercial, statistical, personal, or by way of discussion and investigation. Thus, in 1885, we printed nearly 600 pages of reading matter, of which at least a third were in solid type, and we illustrated the text with over 960 cuts, many of which were very large and very costly to produce. All the new electrical patents taken out in this country were described, and in order to render the paper representative of all sections, we established branch offices in New England, the West, and Philadelphia. Nothing new, in any way vital, essential or material, was left unnoticed, and the manner in which our pages reflected the advance of electrical study and discovery is suggested by the most casual reference to the scientific review, appearing in the paper to-day. And while our readers have had the fruits of the work of a larger staff, they have also been able to enjoy the writings of several distinguished electricians, contributed specially to the WORLD. They have, moreover, been enabled by the advertising pages to purchase whatever they wanted, under the most advantageous circumstances, and often by means of timely hint or note to effect an economy or to adopt a new practice that repaid them the subscription to the paper a hundred times over. As for the New Year, we may say that we have already laid plans for improving the paper in various respects, and that we propose at an early date to begin the publication of various articles of remarkable interest by specialists celebrated in their respective branches. The present issue is, in fact, an earnest of our intentions, as it is of the fulfillment of the wish for a Happy New Year with which we heartily greet our many friends.

Electrical Advance in America in 1885.

The scientific and practical progress of the year, although it has been steady, can hardly be said to have resulted in many startling innovations. In reality, however, the results of previous labors have been strengthened and developed by the growth of the last twelve months.

THE TELEGRAPH.

Perhaps the most decided progress in this field which can be noted as the result of the year is the inauguration of the Phelps induction telegraph system to and from moving trains. A portion of the New York, New Haven, & Hartford Railroad has already been equipped on this system, and negotiations are now in progress for the similar equipment of other roads. We must also note the remarkable fact recently developed in these experiments, viz., that the absolute insulation of the main line is not essential. [See E. W., Feb. 21 and Dec. 5, 1885.]

The Delany synchronous multiplex telegraph has also taken part in the march of improvement, and our recent description of it [E. W., Nov. 14, 1885] shows that decided progress has been made. New York has been connected with Philadelphia and Baltimore by this system on the B. & O. wires.

The new method of Von Hefner Alteneck of printing Morse characters by lines of unequal thickness and at right angles to the length of the paper will no doubt save a good deal of paper to the telegraph establishments of foreign countries in which Morse printers are still used for receiving messages [E. W., Oct. 24, 1885].

The sounder has also been the subject of an improvement of no mean value, preventing the continual short circuiting of the local battery [E. W., Dec. 12, 1885].

The Van Rysselberghe system of simultaneous telegraphy and telephony over the same wire has obtained a firm hold in Europe. Belgium, Switzerland, Spain and Portugal have adopted it, while France is now experimenting with it. A few trials have been made on our continent, and we believe some of the South American republics will shortly adopt it.

We must also draw attention to the rapid introduction of hard-drawn copper wire for telegraphic purposes, the great advantages of which are so well shown by Mr. W. H. Preece [E. W., Oct. 10, 1885.]

THE TELEPHONE.

The year has been prolific in the production of telephonic apparatus. A telephonic relay, of the results of the trials of which we are still uninformed, was invented by Mr. Perrin, of Brooklyn [E. W., Sept. 19, 1885].

The Greenfield "Listening" telephone system was first introduced to public notice by us [E. W., Sept. 5, 1885], and is an interesting and valuable addition to telephonic apparatus.

Of the numerous telephones there are some of decided originality. We need only mention that of Taylor [E. W., April 25, 1885], in which the attraction and repulsion of two parallel layers of wires is utilized as the acting force. We also described the new arrangements of Thompson and Jolin [E. W., May 23, 1885], Lever [June 20, 1885]. Bassano-Slater [E. W., Aug. 1, 1885] ,Ochorowicz, [E. W., March 28, 1885].

Considerable interest has been aroused in the Freeman double contact telephone transmitter, in which, it is claimed, actual breaks of the current take place [E. W., June 13, 1885].

ELECTRIC LIGHT.

From a scientific stand-point the tests of the Franklin Institute of lamps and dynamos occupy the most prominent place in the annals of the year. They showed that decided improvements have been made in the efficiency of incandescent lamps, and that the dynamo has reached a state of perfection which it will hardly exceed much in the future. These tests are a notable contribution to electrical literature, but are still undergoing sharp criticism. [E. W., July 11, Aug. 29, Nov. 14, Dec. 19, 1885].

We must note here also the tests at the South Foreland Light-House, England, which went to prove the superiority of the electric light in all weathers.

Under the head of electric light, the storage battery may be classed as a cognate subject. In our own country the work of Mr. E. P. Roberts, at Cheyenne, in distributing light by secondary batteries, is well known, and his plant has been extended during the year to a considerable extent [E. W., July 25, 1885]; it shows that with intelligent handling the secondary battery has to-day a commercial value which cannot be gainsaid. Mr. Preece's continued success with the secondaries also bears out this statement.

It is rather unfortunate that train-lighting by electricity has made but little progress during the year, and that Americans especially have been slow in this direction.

Electric lighting by primary batteries has taken a firmer stand than ever during the year, and this method bids fair in certain cases to see a more general application.

APPLICATION AND DISTRIBUTION OF POWER.

This department of electricity may, more than any other, be said to have received a decided impetus during the year, and in the advance our own country has taken a most active part. The eminent adaptability of the system of electric locomotion has led to the equipment of several electric railways. New York, Baltimore, Cleveland, South Bend and Philadelphia are already equipped with them, and several others are contemplated, at Boston, Washington, Nahant and other places. New York has been the scene of an especially interesting development during the year in this line, the trial of the Daft motor on the elevated railways of the city having attracted universal attention [E. W., Sept. 29, 1885], and constituting a large advance toward the adaptation of electricity as a motive power for these roads.

Europe has also seen numerous extensions of electric railways.

Telpherage, the ingenious creation of the late Fleeming Jenkin, has also received its first practical application during the year, and the success of the venture seems to be beyond a doubt.

M. Deprez was by no means idle during the year, and his long-promised experiments of long-distance transmission have at last been begun. We have dwelt at length upon this subject [E. W., Nov. 28, 1885, *et seq.*], as it is one of the greatest importance, and M. Deprez deserves credit for his perseverance in this field. He has succeeded at Creil in transmitting 40 H. P. over a distance of 35 kilometres in a loop circuit, with an efficiency, as he claims, of nearly 50 per cent.

A new departure in electric distribution must be noted in secondary generators devised by Messrs. Zipernowski and Déri, to which we have on several occasions drawn attention [E. W., Oct. 24 and Dec. 19, 1885].

UNDERGROUND WORK.

No strikingly new principles have been evolved in this field during the year, although activity in putting wires underground was never more brisk than in the last twelve months. Chicago may be said to have led in this direction, but even there but a small part of the total number of wires is buried. The New York and Brooklyn Underground Wire Commissions have begun their work, the latter even making a preliminary report, which leaves the question of feasibility decidedly unsettled, at least in the minds of the commissioners.

MISCELLANEOUS PROGRESS.

During the year electro-metallurgy has made a decided advance, the new electrical furnace of the Messrs. Cowles marking unmistakably an epoch in this branch. The results obtained thus far are most encouraging, and further experiments will, no doubt, serve to put this system upon a solid basis.

The static electric-machine has also been applied to new uses during the year, the most interesting of which is that of the condensation of fumes in the manufacture of zinc oxide. The production of ozone for disinfecting purposes by means of the static machine has also been described [E. W., Sept. 19, 1885].

The selenium cell has been the subject of continued study during the year, and the most interesting result arrived at is that other substances besides selenium, such as sulphur, show similar properties. The production of electricity direct from sun light by means of the selenium cell has also been raised to a prominent place during the year, Mr. C. E. Fritts being still at work upon this interesting problem, the results obtained being of the highest scientific value.

Several forms of primary batteries have also made their appearance, among them Professor Dolbear's [E. W., Oct. 10, 1885]. Jablochkoff's "auto-accumulator," for which so much was predicted by the inventor, although original, seems not to have been looked upon with great favor.

Numerous galvanometers and electric meters have been brought out, some of them of eminently practical value.

The human body also has been the subject of study from the electrical standpoint, Dr. Stone having shown, during the year, that the high resistance formerly assigned to it is an error. Dr. Ochorowicz also has demonstrated the value of the magnet as a hypnoscope [E. W., Jan. 10, 1885].

Among the applications of electricity in the arts, sugar manufacture may be signalized as one in which, it is claimed, great improvements have been made; an American, Prof. Friend, being the inventor of a process, the nature of which has not yet been made public. Other experimenters have also been busy in this line, among them the German and French.

Seeing by electricity has been the subject of further investigation, which has resulted in a new form of apparatus for that purpose by a German, Herr Nipkow [E. W., Nov. 14, 1885].

The production of electricity directly from coal has also advanced a stage. [E. W., July 18, 1885.]

The year has fortunately been passed with but few breaks in the ranks of electricians, but even those whom death has taken from us we could hardly afford to lose. The recent death of Prof. Fleeming Jenkin has closed a career of great brilliancy and usefulness, but the work he had already accomplished will be a better monument to his genius than the hand of man can raise.

Erie and New England Telephone Figures.

The Lowell *Times* contrasts Erie and New England telephone stocks, at the expense of the latter. "Erie," it says, "has some 9,000 subscribers and a capital of $4,800,000, or at 30 would figure $1,440,000, while New England at 32 would figure $3,840,000, or $384 per subscriber as against $160 for Erie. New England has the protection of some of the American Bell managers, who are heavy holders, and they, with their brokers, hold the stock up. Many unfortunate holders among our citizens would hold it up to 100 so that they could get out. Erie holds up wholly upon its sound condition and continued improvement in many ways. One year ago the stock was a drug on the market at 18, now it is scarce at 29¼ bid, with 30 asked, a rise of $12 per share, or $576,000 on the entire stock; that is, the stockholders have had a rise of $500,000 in their stock in 12 months, and an equal rise in the next 12 months, at least, would not be surprising. One important fact in favor of the company is that its stock is passing from the hands of temporary holders, who carry it at the broker's on margin, to permanent investors, nearly 2,000 shares, it is said, having been changed in this manner during last week. The debt of Erie is now $45,000, with prospects of a further reduction of $5,000 this month. One year ago New England sold for 35, and it has since been trying unsuccessfully to hold that figure. The management of the company is expensive, it has a heavy mortgage on it in the way of Bell franchise stock, and while the business might be largely remunerative to investors, with the present encumbrances, the prospects are poor. A combined movement on the part of the stockholders demanding a concession from the Bell Company is the only thing that will ever place the company upon a dividend-paying basis, from present appearances."

Electricity and the North Pole.

BY AN OLD TIMER.

Many people who ridicule the idea of spending so much money and of enduring such suffering as seem necessary for Arctic discovery would say less if they understood the possible advantages to be gained by reaching the north pole.

It has been known for a long time that in some prehistoric age, what is now the arctic zone enjoyed a torrid climate. The bones of animals and the remains of trees that could only exist in a torrid temperature are found in the most northern latitudes, but the why and the how has not until recently been satisfactorily explained. All people of moderate reading have an idea of the nebular hypothesis; they have heard that originally the universe was all gas; that gradually this gaseous matter became more tangible; that after a while the atoms which were to form the earth organized a guild, gathering to themselves all the good looking atoms with which they came in contact, until they formed a sort of comet which for ages roamed through the universe like a wild colt over an unfenced prairie; that after it had sown its wild oats and become somewhat sobered the sun adopted it and put it on a course of training, and that it has never since been able to loosen itself from the sun's apron string.

It soon became crusty under the restraint and rapidly lost its fiery nature. The different portions which became solid by loss of heat were all thrown together by its diurnal revolution and all the land was in one piece, reaching from pole to pole.

The axis of the earth at this time was perpendicular to the plane of its orbit, causing all parts of the earth to have equal day and night and no change of seasons. Now this would never give the polar regions much benefit from the sun, and neither the light nor the heat of the sun would have developed the enormous plants and animals whose remains are now found in those parts; but in those palmy days the sun was not the only source of light and heat; the earth revolving rapidly upon its axis was then, as it is now, a vast dynamo, generating incalculable quantities of electricity, and at that time it had vent at the *North Pole*, producing an electric light sufficient to light and heat all the surrounding country, and under its constant blaze vegetation and animals prospered. It was probably the combined effects of the sun and this great northern light which produced the formation of our coal fields. For how many millions of years this bright state of affairs existed we are not able to state.

Unfortunately the earth was not the only matter that was cooling. An immense meteor or juvenile world coming within its sphere of attraction was drawn towards it, and fell upon the north pole with such force as to almost completely stop the egress of the electricity, and only a few faint streaks of light have since been emitted, and they are known as the aurora borealis.

This event caused many and momentous changes. The immense energy continued to be developed, and having no vent caused great commotion in the bowels of the earth. It not only rent the land in twain, forming the two principal continents, but shivered huge pieces from its borders, scattering them over the ocean, forming the islands, taking with them all their inhabitants, and thus the earth was peopled from one stock. Earthquakes and great convulsions ensued, throwing up the vast mountain-ranges which for ages were living volcanoes. All the northern portions of the earth cooled quickly and the glacial epoch followed, and since that day many parts of the earth have been frequently devastated by earthquakes caused by the inability of this energy to escape by its natural channel.

Amongst other important changes caused by this incident was that the northern portion of the earth receiving so great an addition to its weight, the earth lost its equilibrium and careened over to its present position, inclining the axis, thereby causing the change of seasons.

Recent developments of science render it quite probable

that, to a certain extent, that great natural source of heat and light may be restored to the arctic regions.

The continuance of the aurora borealis proves that there are crevices not yet closed, which may easily be enlarged by dynamite. The existence of an open polar sea indicates that the crust of the earth is still so thin that the internal heat prevents the water from freezing, and therefore it would not require a very deep drill-hole in that North Pole to furnish sufficient electric light and power for the necessary excavation and other preparations for charging the whole mass with dynamite and rack-a-rock; then, by using the Bishop gutta-percha fuse and about forty miles of torpedo cable similar to that made by the Bishop Company for the Chilian and Russian governments, the engineers might from a safe distance remove by explosion sufficient of the obstruction to scatter the icebergs and white bears, and Greenland and Iceland might again become the Edens of the earth; earthquakes would be no more, and Hudson Bay would become the Mediterranean of the Western continent.

Microphones and Deafness.

A prize is offered of 3,000 francs by Baron Leon de Lenval, of Nice, France, for the best readily portable instrument constructed according to the principle of the microphone, for improvement of hearing in cases of partial deafness. The Award Committee will receive instruments intended for competition up to Dec. 31, 1887. The awarding of the prize will take place at the Fourth International Congress for Otology, to be held at Brussels in September, 1888. There are a number of men in our country who ought to take up this subject, their previous work in this direction eminently fitting them for it, Mr. Edison and Prof. Bell being among them. The latter, as is well known, has long devoted himself to the education of the deaf and the alleviation of their affliction.

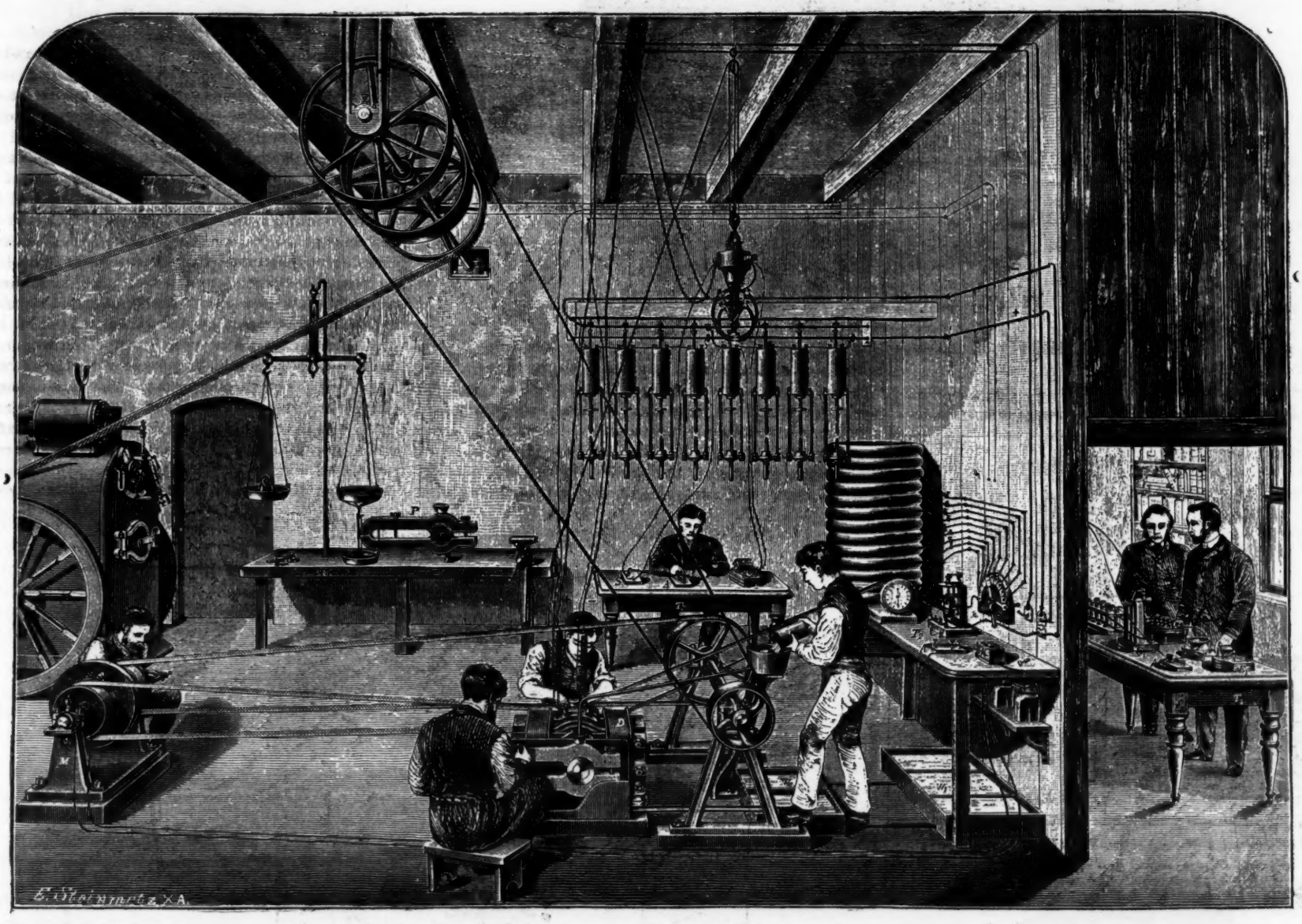
Upholding Edison's Telephone Patents in Canada.

In giving judgment upholding the validity of the Edison telephone patent and dismissing the application to have it annulled, Dr. Tache, Deputy Minister of Agriculture for Canada, holds that the charges of importation, non-manufacture, and refusal to sell had not been proved as regards patent Nos. 8,026 of 1877, 9,922 of 1879, and 9,923 of the same date, issued to Thomas Elva Edison, and now owned by the Bell Telephone Company. He decided that the setting aside of Bell's patent last year for importation and refusal to sell did not affect the Edison patent, though both were owned by the same company. The voidance of one patent for telephones does not, in the Deputy Minister's opinion, entail voidance of another patent for telephones, because they stand as distinct combinations. Bell's patent was declared null and void by the Minister of Agriculture because there was ample proof of importation in forbidden time having taken place to the notable detriment of home labor, and because there was sufficient proof of refusal to sell which amounted to non-manufacture, while in Edison's case there was no such proof as applied to any one of the three Edison patents. These several patents acquired by the Bell Company are all for the purpose of telephonic communication. They all make use of the same elements, but they are distinct combinations and have a right to stand as separate inventions. This is a fundamental principle in patents in all countries, there being everywhere a great many patents of combinations for an entirely new art or mechanism. It is further declared that a patentee is within the meaning of the law in regard of his obligation to manufacture, when he has kept himself ready either to furnish the patented article or to sell the right of using, though it may be that not one single specimen of the article has been produced, and he may have voided his patent by refusal to sell, although his patents were in general use. The Bell Company, therefore, continue the telephone monopoly in Canada with the help of Edison's patents.

The Heinrichs System of Arc Lighting.

In our last issue but one Mr. Charles F. Heinrichs, in criticising the results obtained in the Franklin Institute dynamo test, drew a comparison between these results and those obtained with his own machine. The high efficiency which the latter tests show seems to have aroused the curiosity of a number of our readers, and we therefore propose to describe Mr. Heinrichs' system, which was first brought out by him while temporarily residing in Europe, and which is decidedly novel in many ways, not only as regards the machine itself, but the arc lamp employed by him, which is also of a decidedly ingenious character.

The Heinrichs machine, a general view of which is shown in Fig. 1, and of which a cross section taken through its axis of rotation is shown in Fig. 3, possesses certain points of resemblance to the dynamo electric machines of both Siemens and Gramme, while at the same time in its most essential features it differs from either and from every other electric generator. Its point of resemblance to the Siemens machine consists in the method by which the magnetic field is excited, and in the general disposition of the field magnets; while its point of resemblance to the Gramme machine lies in the fact that its armature is of angular form, and is wound, Gramme fashion, with insulated wire forming a closed circuit. The armature differs, however, from the Gramme ring in its totally different cross section, which instead of being rectangular, as in the Gramme machine, is U-shaped, as seen in Figs. 2 and 3, the former representing a portion of the ring partly wound and having the U-shaped core-ring R and its coils of insulated copper wire $C\ C$. The construction of the armature ring will be best understood by referring to Fig. 2, while the general construction and arrangement of the machine is very clearly shown in Figs. 1 and 3. Referring to the latter figure it will be seen that s is a shaft driven on a horizontal axis by the belt pulley p. To this shaft is keyed the boss $a\ a\ a$ carrying the armature ring $r\ r$, which is of very peculiar construction, being of U-shaped section and having wound upon it D-shaped helices which, during the working of the machine, are revolved within an intense magnetic field produced by the electro-magnet extension pieces $m^1\ m^1\ m^1$, etc., $m^2\ m^2\ m^2$, etc., which are excited by the powerful rectangular magnetizing helices $w\ w\ w\ w$, which form part of the main circuit of the machine. The various armature coils communicate, as in most machines of the Gramme type, with a set of copper segments $c\ c\ c$, etc., forming a cylindrical commutator, containing as many segments as there are wire helices on the ring; on to these commutators are pressed a pair of collecting brushes, by which the currents generated in the armature are transmitted into the magnet coils and external circuit. It will be observed that a special feature of this machine is the lateral disposition of the polar extensions of the field magnets, which are so placed with respect to the sides of the armature as to embrace and be very close to every portion of its external convex surface, and it is this feature which, while considerably increasing the efficiency of the machine, constitutes the essential difference between the field magnets of Mr. Heinrichs' machine and those of the machine of Siemens.



TESTING THE HEINRICHS DYNAMO.

The armature ring, more than anything else, is the characteristic feature of Mr. Heinrichs' machine. We cannot here enter upon the considerations which led to the adoption of this particular form, but may state that it is the result of a theory proposed by Mr. Heinrichs and calculations based thereon.

The ring is constructed by coiling upon a thin cast-iron mold or shell $r\ r$ a quantity of soft charcoal-iron wire, which, in the three-light machine, illustrated in Fig. 1, is of No. 10, B. W. G. The peculiar form of this shell gives great facility to the coiling of the iron wire core so as to insure its U-shaped cross section and circular form; and, when completed, the ring-core consists of a thick iron ring, convex on its outer circumference, but having a deep grooved channel around and within its inner surface.

On this ring-core is wound, after the manner of a Gramme armature, a number of D-shaped helices of insulated copper wire, which, in the six-light machine, are of No. 16 B. W.G. (*i. e.*, about .065 inch in diameter), wound in thirty-six sections, their ends being connected to as many copper segments forming the commutator, and constituting a closed circuit, and the ring is held on to the boss by six brass loops, of which two are shown in Fig. 3,

marked a^1 a^1, a^2 a^2. These loops pass over the iron wire core, one at every sixth section, and their ends are attached by screws to the boss *a a*. Besides holding the ring-core in its place, these brass strips form so many openings from the inside of the ring into the channel, and thus, by ventilating the armature, help to keep it cool.

This peculiar form of armature, according to Mr. Heinrichs, accounts for the high efficiency obtained by him, and the results of a series of elaborate and careful tests made by Messrs. Alabaster, Gatehouse & Co., of London, certainly show his machine to be well designed. These tests extended over a period of five weeks, and were made with great care. Our large illustration gives a perspective view of the testing installation. The pressure on our space forbids our entering into a detailed description of the methods and apparatus employed. We give below,

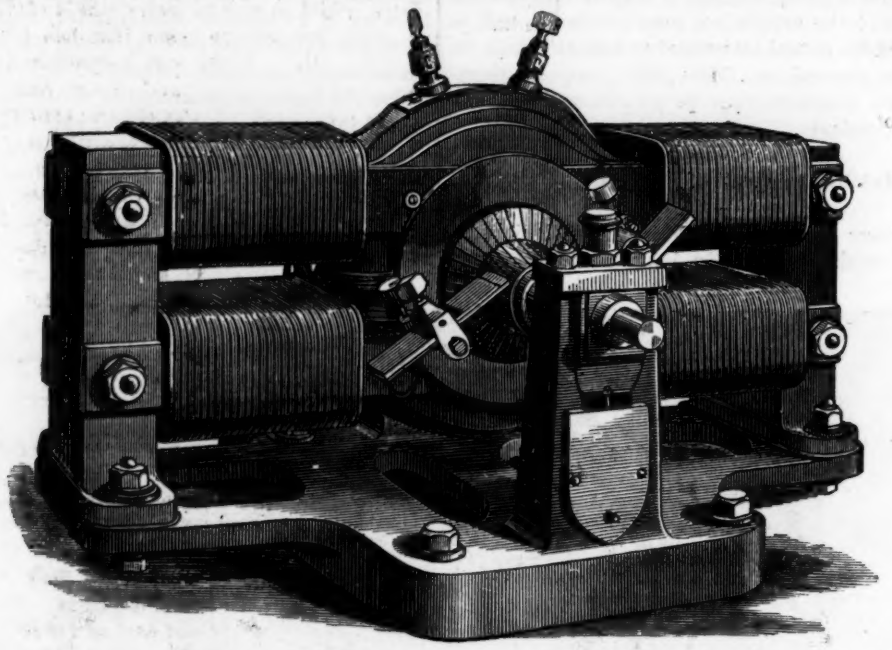


FIG. 1.—HEINRICHS DYNAMO.

however, the result of the tests in efficiency of the machine:

Number of test.	Description.	External Circuit. Electromotive force of lamp.	Percentage of Efficiency. Absorbed power into converted current.	Total power converted into current.	Ratio of total current appearing in external circuit.	Ratio of absorbed power appearing in external circuit	Ratio of total power appearing in external circuit
No.	v.	el.	I.	II.	III.	IV.	V.
1	Wire resistance.....	.. ..	97.0	90.0	65.8	64 0	60.0
2	" "	.....	98 4	88.0	78.5	77 4	69.0
3	" "	.....	98.5	89.0	85.7	84.5	76.4
4	Circular carbon lamp and wire resistance....	43.0	98 0	88.6	85.4	83.8	75.5
5	8 lamps in 2 parallel circuits, 4 lamps in each circuit....	45.0	97.2	92.3	82.6	80.4	75.6
6	Wire resistance.....	.....	98.9	91.0	84.2	83.2	77.5
7	4 lamps in series.....	48.2	98.0	83.7	90.0	88.5	75.8
*	8 lamps in 2 parallel circuits, 4 lamps in each circuit...	40.5	.....	.....	.....	.....	.....
*	Wire resistance..... ...	. ...	98.4	91.8	83.0	82.4	76.5

These tests show that the machine gives to the external circuit a current of 48 watts per pound of copper wire

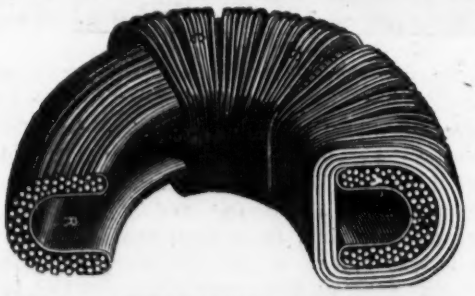


FIG. 2.—HEINRICHS ARMATURE.

field magnets and armature), and a current of 280 watts for every pound of copper wire on the armature. Further, it supplies one light requiring a current of 12 ampères and 40 volts electromotive force for every two pounds of copper wire on the armature, and for every twelve pounds of wire on the machine. The mean diameter of the armature ring of Mr. Heinrichs' three-light machine is 8 inches, which, at a speed of 1,500 revolutions per minute, at which it is driven, gives a circumferential velocity of about 3,300 feet per minute, a comparatively moderate speed. The four magnet coils contain about 80 pounds of insulated copper wire, .14 inch in diameter (about No. 9½ B. W. G.), and there are 16½ pounds of No. 16 wire on the armature of the six to eight-light machine.

We reserve for our next issue the description of Mr. Heinrichs' arc lamp, the distinguishing features of which are the curved carbons employed, and the absence of all regulating mechanism. Mr. Heinrichs' machine and lamps have been in operation in this city for some time.

Electricity as Applied to the Refining of Sugar.

BY ERNEST HUBON.

If an electric current is passed through a concentrated sirup of pure sugar mixed with foreign matter, salts and colored organic substances, the two insoluble electrodes being separated by a porous partition, the following phenomena are observed: 1. At the anode a marked discoloration takes place, accompanied by a liberation of oxygen. 2. At the cathode there is observed an increased volume, a darker coloration, a disengagement of hydrogen and the metallic bases resulting from decomposition of the salts. In certain cases the discoloration is accompanied by a precipitate, which is filtered out after the cessation of the current.

The current ought to be varied according to the proportion and nature of the foreign matters, the degree of concentration of the syrup, and the temperature. These different causes may vary the resistance of the sugary liquid very largely, and which of itself is always considerable.

The current ought not only to effect the elimination of the salts at the positive pole, but it should at the same time be able to "invert" the sugar. With a suitable current, however, the mineral and organic salts and albuminous matters are decomposed in the presence of the sugar, without causing a sensible change in the latter. The action is, therefore, one of purification as well as of discoloration.

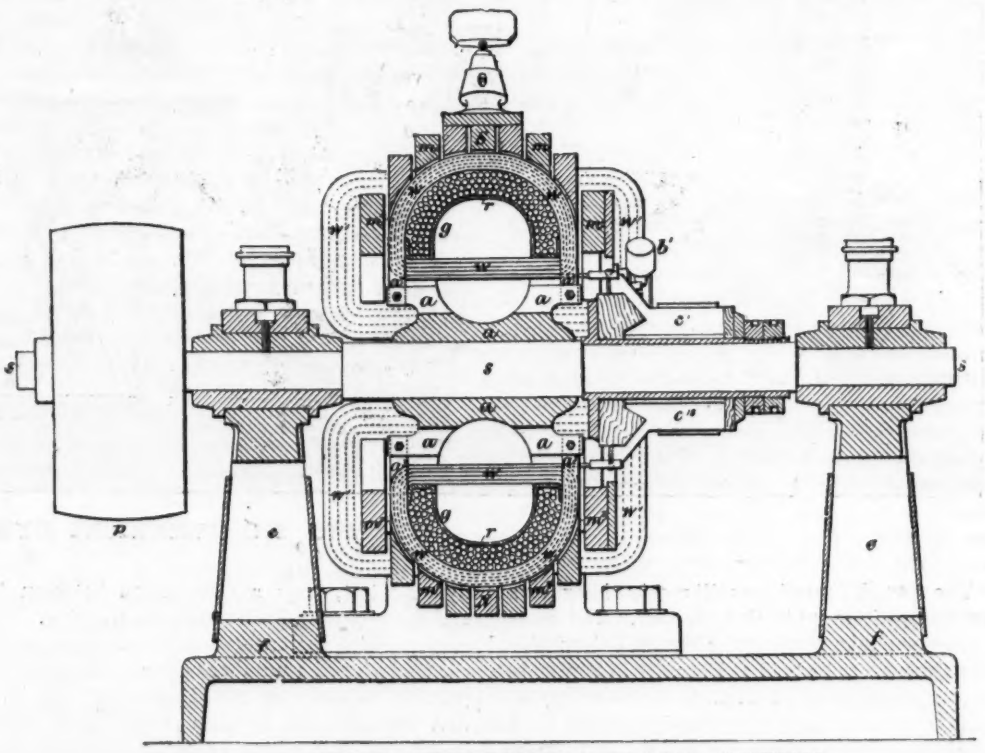


FIG. 3.—HEINRICHS DYNAMO—SECTION.

The above conclusions, which are the results of numerous experiments, are embodied in a patent (French) of April 7, 1885, No. 168,119. They are partly confirmed by those of Prof. Landolt, made on the 21st May following, at the meeting, at Dresden, of the sugar manufacturers of Germany. His conclusions, identical to mine with respect to the purification, are somewhat contrary as to the discoloration.

According to my experiments, the sugary liquid is purified, and changes to a lighter color, becoming a yellowish amber. Mechanical agitation increases its movement of diffusion through a septum, parchment or porous cup. Now, in actual sugar refining the second and third drip sirups and the molasses are subjected to the action of osmose.

There is obtained 15 parts of sugar for every 100 of molasses; there is lost in the water of exosmose 6 parts of sugar; the volume of this water is considerable, being 5 or 6 times that of the molasses. The mineral salts and any nitrogenous coloring matter, together with the vegetable salts, are completely eliminated. In addition, the sugars obtained by the boiling of the second and third drips and the molasses of osmose receive a lighter and lighter coloring.

What I have just said will suffice for the present to show the possibilities and importance of the application of electricity in the sugar industry.—*L'Electricien.*

We may add to the above that the complete extraction of juice from what is generally but erroneously called beet root—*betterave* is really mangold wurtzel—is rendered very difficult on account of the presence of alkalies in the juice, which prevent the crystallization of the sugar. A process for neutralizing these alkalies has been patented by M. Despeissis, whose invention has this further advantage, that the salts contained in the saccharine solution are obtained in such a manner that they can be turned to profitable account. The process is founded on the fact that, if an electric current be made to traverse a liquid containing a salt in solution, the base of this salt, which is decomposed, is transferred to the negative and the acid to the positive pole. If there be a porous diaphragm between the two poles, so that the current may pass, but the two liquids can only mingle slowly, the acid and the base of the salt, set free, cannot immediately recombine. The current is produced by dynamos or batteries; and the electrodes that M. Despeissis prefers to use are those of carbon or platinum, while the porous jar may be of unglazed clay, carbon, or parchment. During the electrolysis, it is especially the carbonic acid which is disengaged; and this acid, which partially remains in solution, is not injurious to the sugar, while it may also be neutralized by lime. When the liquid is raised to a suitable degree of heat, this carbonic acid is neutralized by the formation of insoluble carbonates, which, on being deposited, also take with them the coloring matters. The sirups and molasses may be treated by the action of heat; and this method has the advantages, that the hot liquid offers less resistance to the electric current, and is sufficiently fluid to render the addition of water unnecessary. Moreover, the high temperature facilitates the escape of the gases which are not deposited on the electrodes. The elimination of the alkalies is effected by means of a filled vessel placed in the juice, and in which the negative electrode is immersed; it is also advantageous to immerse the positive electrode in a porous jar filled with water, and placed in the body of the juice. In this manner the acids and the iron contained in the saccharine matter go to the positive electrode, and the alkaline bases to the negative electrode. The porous jars facilitate the separation of these substances, which are injurious to the saccharine juices, thus permitting a higher proportion of crystallizable sugar to be obtained.

Sending Hosiery by Telegraph.

One day last week a young man entered the Hartwell, Ga., telegraph office with a sealed letter. He told Champion, the operator, that it was sealed and stamped and that he wanted it sent to his sweetheart at Bowersville, by telegraph, and for him not to open and read it. Champion directed him to the post office.

This reminds the local paper of one of "Old B.'s" yarns. He said that during the war when the militia were about Savannah, an old lady who had a sixteen-year-old son down there went to the depot at Greensboro' with a pair of wool socks which she wanted sent to her "bold soldier boy" by

telegraph. Some men were working about the depot. One of them told her to walk into the office and he would hang the socks on the wire, and in a few moments she would hear from Jim. The man pulled off his dirty, well-worn socks, and putting on the new ones, hung the old ones on the wire, and went in and told the old lady that Jim had received the socks and sent back his old ones, which were hanging on the wire. The delighted old lady raised her spectacles, saw the old socks, and requested the man to take them down, remarking in a voice full of pride and tenderness:

"Jus' like Jim—he always wuz a keerful, savin' boy; an' he has sent his old socks back for his mammy to darn 'em—God bless him!" And in turn we say God bless all such innocent, tender-hearted mothers as Jim's.

Telephonic Systems.*

(*Continued.*)

BY PROF. A. E. DOLBEAR.

Farrar. of Keene, N. H., discovered in 1851 by experiments with electro magnets and vibrating reeds that completed and broke an electric circuit, that the magnet was capable of responding simultaneously to several distinct series of such reed vibrations, and that suggested to him that if he could contrive to vary the electricity in the circuit by voice vibrations, as he did with the reed vibrations, that he

FIG. 1.—FARRAR.

could electrically transmit speech. He was not able to devise an appropriate transmitter, and was discouraged from the attempt by the expressed opinion of the impossibility of doing it by Prof. Silliman. He had, however, the receiver, and had proved its ability to act in the way proposed. I cannot allude to Farrar's system as complete, for the work was but half done, and I therefore put in the place of the transmitter the interrogation point to indicate what was lacking, Fig. 1.

REIS' SYSTEM.

Nearly ten years after that, Reis of Germany invented the mechanism that Farrar lacked, namely, an apparatus that was capable of responding to the minutest shades of acoustic vibrations, and having an automatic attachment making part of an electric circuit, the motions of this attachment, or the electrodes, as they may be called, being governed altogether by the sound waves in the air, Fig. 2.

Reis made a number of transmitters varying the me-

FIG. 2.—REIS.

chanical details in each, but they all had in common a membrane stretched taut over an aperture, and against which sound waves of any kind were to impinge. This membrane had fastened to its middle a thin strip or disc of platinum foil which was connected by a wire to a binding post. Connected to another binding post was a metal strip reaching to the middle of the membrane, where a piece of platinum wire fixed at right angles was so adjusted by a screw as to touch gently upon the platinum disc, and so complete the electric circuit with a battery and an electro-magnet for a receiver. The energy of the sound waves was employed to control the electric energy in the circuit, and it was expected that any change in the one would make a corresponding change in the other. That Reis expected this is perceived in his lecture, where he gives the curves for compound sound vibrations in air, a continuous and not a broken one, which, if it was to be transmitted and reproduced, must not have lost any of its characteristics. It is certain that

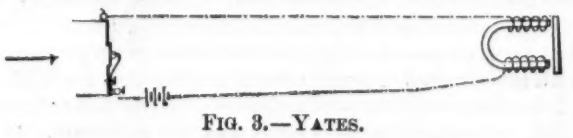


FIG. 3.—YATES.

he intended to have reproduced in his receiver all the characteristics of the sounds made at the transmitter. He explains the action of his transmitter as making and breaking the circuit for every vibration of the membrane, and a deal of wearisome talk has been made of late years about Reis' *intention*, one party declaring the intention to be in the function of the apparatus to transmit and reproduce sounds of all kinds with their characteristics, and they point to Reis' statement that he thus did transmit and reproduce the sounds of the piano, accordeon, clarionet, horn, organ pipes and speech. The other party declares that Reis' intention was to make and break the circuit for every vibration, and therefore he could not possibly have intentionally transmitted speech, for a continuous circuit and an undulatory current are essential to do that. If, therefore, Reis did do what he says he did, it was accidentally done, and the apparatus was not working as it was intended to work. It ought to be remarked that if the tones of the above named instruments were reproduced, there must have been the same continuousness that is now insisted on as being essential for the transmission of speech, for the sound of a piano string is made up of a number of separate tones in harmonic series, and continuity is as much a characteristic of such sounds as of any other. But Reis distinctly says that he was able to transmit human speech, adding, "though not with distinctness sufficient for every one," which implies, if anything, that it was distinct enough for some. Reis explains the lack of distinctness to which he alluded as being due to the fact that the higher overtones were too weak in the receiver for all to hear—not that some of them were not present at all. But

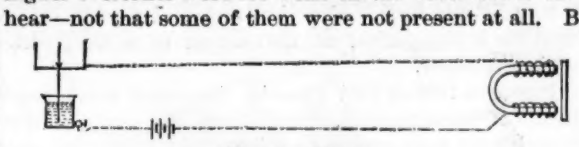


FIG. 4.—GRAY.

that objection of a lack of distinctness was brought against the telephone of the present day. Over and over again I have heard persons say when first listening to a telephone that was speaking well, that they couldn't hear what was said, and I dare say every one has had a similar experience who has worked with telephones to any extent. The fact is, that nearly every one requires some experience with a telephone before he can make out all that is said, and Reis' audience was not made up of experienced persons. There is, however, no reason at all to doubt that Reis did transmit speech with his apparatus, for, as I have said before, the working of the transmitter is *automatic*, and depends upon the sound waves that fall upon it, and not upon any one's intention of how it shall do its work. Take any Reis transmitter and couple it in a circuit with a battery without any receiver. Now speak to the transmitter. Will the sound waves vary the current strength in a proportional way? In other words, will the current be the kind known as undulatory and one capable of reproducing the words spoken? There is only one answer to this question; there are no ifs nor

FIG. 5.—BELL.

buts about it. Whether they be heard or not is another question, depending upon the kind of device used for transforming the electric energy, and its degree of sensitivity, also the acuteness of hearing of the one who listens. If an electro-magnet ill-adapted to the conditions be used for a receiver, the speech might not be heard, but it would not be because the character of the work of the transmitter was at fault, but because the receiver was not delicate enough. To say otherwise would be like denying the existence of a current of electricity in a circuit because the needle of a galvanometer made for strong currents gave no indication of one. If it is of any importance to know whether there be a current or not, include in the circuit the most delicate galvanometer to be had. The test for the character of the working of the Reis transmitter is similar—put the most delicate receiver at hand in the circuit and listen. When such a test as that is applied it is always found that the current from a Reis transmitter is identical with the one in common use to-day for telephonic purposes. Where

FIG. 6.—DOLBEAR.

this is done, however, the deniers of Reis' claim assert that the transmitter works on account of knowledge acquired since 1876, but they know better, and argue thus for commercial reasons only. Indeed, I think it proper to say here that I have conferred with a great number of electricians in various parts of the country about this matter, and there is the greatest unanimity concerning it, that Reis did invent a speaking telephone, that he used it for that purpose, and that it works in the same way as does the modern commercial telephone. A number have given me testimonials to that effect, and several who do not wish to be mixed in the controversy express privately to me the same views precisely. The only ones that oppose it are those who have a pecuniary interest in denying it.

Reis' system of telephonic transmission consists in the employment of sound vibrations to operate upon electrodes so as to vary the resistance at the electrodes, and thus control the current in conformity to the sound vibrations. His transmitter is more properly an automatic governor of the current which is provided by a battery in the same circuit. His receiver consists of an electro-magnet mounted upon a resonant case. Of these there are two varieties: one an electro-magnet without an armature, in which the varying current changes the magnetic strength, causing a corresponding molecular rearrangement, which produces the sound in air reinforced by the case; the other an electro-magnet with an armature provided with a spring to oppose the magnetic attraction on the one side, and a stop screw to prevent contact with the poles on the other side. The main source of the sounds in this is due to magnetic induction upon the armature, just as in the telephone of to-day. This too is mounted upon a resonant case. The instrument very closely resembles a common relay; the horizontal magnet, the hanging of the armature and recoil spring are all there, and as might be supposed, a relay makes a tolerable receiver.

Yates, of Dublin, placed a drop of water between the platinum electrodes in Reis' transmitter, Fig. 3, and thus prevented the absolute break in the current to which Reis was liable; he also mounted the electro-magnet of the receiver in a better way, and so got better results. Dr. Hessel, of London, who was one of Reis' pupils, told me that Reis himself placed water and sulphuric acid and sulphate of copper solution and various other solutions in the same place and for the same purpose. This experiment of Yates, which is well enough authenticated for history and credence, teaches one lesson that has been overlooked so far in this telephonic controversy. It has been said over and over and over again that if Reis had actually achieved the electric transmission of speech, that everybody would have heard of it, that it could not have been buried and so little known of it, because the achievement was one of the highest importance, and therefore if so little was known of Reis' speech transmission it was because he didn't do it. But it is not denied that Yates did it in 1866, and that it was known at the time at the University there, but it did not appear to be

FIG. 7.—PRESENT BELL SYSTEM.

of enough importance to even chronicle. Silence therefore does not tell against Reis, but against the contemporaries of Reis and Yates.

The grandest invention is of but little worth except it be allied with business tact and energy. A steam engine is good for nothing without coal and stoking.

Elisha Gray, of Chicago, designed a speaking telephone and entered a caveat for it in the patent office early in 1876. The only difference between his plan and that which I have described consists in the structure of the transmitter (Fig. 4), which consisted of a metallic vessel containing a liquid conductor, the top covered with a diaphragm carrying at its middle a wire conductor reaching down into the liquid. This wire was made part of an electric circuit with the solution and vessel, a battery and an electro-magnet with armature for a receiver. Any sound made at the diaphram moved the wire in the solution in a corresponding way, and so varied the

FIG. 8.—BERLINER.

strength of the current by varying the resistance in the liquid. The receiver had the electro-magnet and armature mounted upon a tube which was advantageous for listening, as the sounds were thereby prevented from scattering to the degree they did with Reis' mounting. It did not differ in principle from Reis, for the series of reactions from the sound to be transmitted to the one that reached the ear were practically the same, namely, the air vibrations acting upon an electrode varied the resistance of an electric circuit maintained by a battery, and the varying current varied the magnet's inductive strength upon the armature, causing it to move in accordance with such current changes.

McDonough, also of Chicago, about the same time had modified a Reis transmitter, by making multiple platinum contacts, and lessening the liability to the disruption. His receiver was similar in structure to Gray's. This, considered as a system, is identical with Reis'.

Drawbaugh, of Pennsylvania, and Meucci, an Italian,

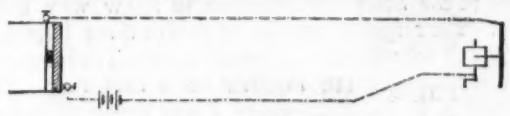


FIG. 9.—EDISON.

both lay claim to the invention of this system.

BELL'S SYSTEM.

Bell departed from the system already described. Beginning with the transmitter he dispensed with the movable electrodes and the variable resistance, and in the place of that apparatus he placed an electro-magnet with its armature, proposing to speak to the armature itself, which being set in forced vibrations similar to the originating sound waves, should react upon the poles of the magnet, and they upon the coils of wire surrounding them, and the current that was maintained in them by a galvanic battery, thus causing electrical waves in the circuit, corresponding with the sound waves which produced them (Fig. 5). The receiver was another electro-magnet similar to the first, but so mounted that the vibrations set up there should reach the ear advantageously. So far as the action at the receiver was concerned, it was similar in all respects to the action in Reis' receiver; nevertheless

* Lecture delivered before the Franklin Institute.

the whole is deserving the distinction of a separate system, for the receiver now became a transmitter, and thus it had an entirely new function in addition to the old one. The really new thing about it was the transmitter, which acted by setting up electromotive forces in the circuit, which reacted upon the electro motive force of the battery, and therefore varied the strength of current in the circuit. The successive steps in this method are sound vibrations in air causing forced vibrations in the armature of the magnet, varying the strength of the magnetic field. The varying field reacts upon the coil of the electro-magnet and the current of electricity present in it, setting up electromotive forces of a vibratory kind, now in this direction and now in that, according to whether the armature moved toward or away from the poles. The action is one of successive transformations of energy, the source of all the changing electromotive forces being the energy of the sound vibrations themselves, and therefore quite unlike the Reis transmitter, which is simply a controller of the electric energy which is provided by a separate source.

In the Reis transmitter the strength of the current is varied by mechanical means directly, while in Bell's transmitter the current is varied by magnetic means directly. The contrast is still stronger, for on the one hand the changing currents are really vibratory, to and fro in direction, while in the other the currents are all in one direction, only varying in strength. The one produces its effects by *changing the direction* of its current, the other by *varying* the strength of a continuous current.

At the receiver the succession of transformations is similar in each. The magnetic changes produced by the current result in a varying magnetic field and a corresponding strength of attraction upon the armature which moves in obedience, and vibrates, imparting its energy to the adjacent air. As a matter of fact the form of the electro-magnet employed for the transmitter was not the same as that used for a receiver. At the Centennial exhibition of the telephone the receiver was a cylindrical electro-magnet, the coil being within the cylinder, the armature being a disc that fitted like a cover upon one end of it. This receiver was given to Sir William Thomson, who carried it home with him. During transportation the armature got bent up to an angle of 40 or 50 degrees from its proper position facing the poles. Sir William testified in a London court, where he showed the receiver with the armature still bent out of place, that he had endeavored to make it talk after his return home, but had not succeeded, and he could not remember but that the armature was intended to be tilted up as he found it on unpacking, so the man who made it was called up to testify what the intention was. I think that any one less eminent than Sir William, who had been called as an expert, who should give such testimony as that, would be at once ruled out as incompetent.

In the same year, 1876, I proposed to employ permanent magnets for both receiver and transmitter, so as to dispense with a battery, and have each instrument of the same form. This was before I knew anything as to the instruments that Bell had employed, and the first one made was with a straight bar magnet, with the coil wound over only one end (Fig. 6). This kind was soon found to be much more efficient than the electro-magnet and battery, and was adopted to the exclusion of the other. Considered as a system, however, it differs from Bell's only in this, that in the latter the generated currents modified the current permanently in the circuit, while in mine the generated currents were the only ones in the circuit. Several electricians have stated that the two are identical, and that the only object of employing a battery was to keep the magnets magnetized in spite of the well enough known fact that a magnet may be made stronger by permanent magnetism than by a current on a line of any considerable external resistance without using an inordinate battery. Somehow I had for twenty years the idea of the reciprocal action of magneto electric devices. I had tried in 1855 to make one magneto machine run another one, and failing to do it wrote to the editor of the *Scientific American* to know why it didn't work. The response was one of two or three lines in the column to correspondents, which answer I have forgotten, for I haven't seen the number since that time. It was marked A. E. D., Mo., where I was living at the time. Also in 1864 I proposed a similar plan for a telegraph, the sender and receiver to be alike and with similar functions. I mention these in justice to myself and in order to point out that there was nothing that was new to me in such combination of action.

The system used at present in *legal* telephony consists of a transmitter of the Reis pattern, and differing from it only in the substitution of hard carbon where Reis used platinum, while for a receiver is used my straight bar permanent magnet telephone of 1876. It is Reis' system plus a permanent magnet (Fig. 7.)

BERLINER'S SYSTEM.

Berliner proposed a still more novel plan for a speaking telephone, because it involved principles unlike any of the others. His system consisted of a transmitter similar to the Reis in principle, and his receiver was a duplicate of the transmitter (Fig. 8). The two similar instruments were to be put in circuit with a suitable battery, when an electric current would traverse the line. Talking to the transmitter would vary the strength of the current, and this varying current would vary the temperature of the electrodes at the receiving instrument enough to develop there what may be called a modified Travellian effect and produce a sound the character of which would depend upon the varying rate of the electrical energy spent at the terminals. The receiver could then be used as a transmitter, so that like the Bell system each instrument had a double function. The Berliner receiver depended upon the convertibility of electricity into heat, the latter at once doing work in moving the diaphragm. This was a highly ingenious plan, and is a system by itself, as much so as any I could name. The same principle has been varied somewhat and improved on by others. I myself in 1878 used the heating effect of the current in a short wire to work a receiver.

Preece in 1880 or 1881 likewise described some experiments of the same sort, while Cross has lately obtained surprisingly good results by using a platinum wire about six inches long fixed to the middle of the diaphragm, and a current strong enough to keep the wire red hot. He described the effect to be such that the talking could be heard several inches from the receiver. In my opinion the transformations of energy are the same in these cases, and I therefore include them under the head of Berliner's system.

EDISON'S SYSTEM.

Ten or twelve years ago Edison discovered that electricity was competent to lessen the friction between two surfaces, and at first adapted the discovery to a telegraphic receiver, and he gave the name motograph to it (Fig. 9). Later he invented a telephonic transmitter in which the current traversed a mass of lampblack fastened between a solid back and a diaphragm against which sound waves

GEORGE SIMON OHM.

could impinge. The vibrations of the diaphragm changed the conductivity of the parts and so varied the current. It is a variable resistance transmitter, in which lampblack takes the place of the platinum in Reis' transmitter. It was impossible on account of the mechanical structure that there could occur a break in the current in Edison's transmitter, and the changes in resistance were sufficiently great to make it excellent for its purpose. Edison then adapted his motograph to telephonic purposes, calling the modification a motophone, when he then possessed a telephonic system which for loudness of performance leaves nothing to be desired. It embodied mechanical details in the transmitter that vastly increased its efficiency, and in the receiver there were transformations electrical, chemical and mechanical, such as had not been even known until his discovery. I am very strongly of the opinion that Edison's system is one quite distinct from any other, being radically different from anything found in Reis, or Gray or Bell.

(TO BE CONTINUED.)

George Simon Ohm.

The name of Ohm is so familiar to electricians that we cannot hope to add anything to its brilliancy. Professor Tyndall has justly called him "the Newton of the galvanic current," and his work may be said to have laid the foundation for the *science* of electricity. His well-known law finds universal application, and upon it many others have been founded. Ohm was eminently a mathematician as well as a physicist, as is demonstrated in his "Mathematical Treatise on the Galvanic Circuit," in which he enunciates his law. His eminent services won for him the Copley Prize Medal of the British Royal Society, evidencing that his genius was recognized in foreign countries as well as in his own.

Ohm was born in the city of Erlangen, Bavaria, on the 16th of March, 1789, and died in his sixty-sixth year, on the 6th of July, 1854. His noble character not less than his scientific achievements commanded the admiration of all.

A Delayed Telegram.

Isaac Blakeney died at Rochester, New York, and his widow, Mary Blakeney, desiring that his brother, John Blakeney, residing at Evansville, Ind., should attend the funeral, sent by the Western Union Telegraph Company the following message:

"ROCHESTER, N. Y., Aug. 22, 1885.

"To John Blakeney, 611 Main street, Evansville, Ind.:

"Isaac is dead. Have telegraphed before. Funeral Monday. Come. MARY BLAKENEY."

The message was never delivered, and John Blakeney was therefore prevented from attending the funeral services. He was warmly attached to his deceased brother, was anxious to be present on the occasion of the burial, and his feelings were said to be severely pained and wounded by reason that his attendance was prevented. Judge Azro Dyer, of the Superior Court, decides in an action brought in consequence thereof as follows:

"By the present action John Blakeney charges that the telegraph company was guilty of negligence in failing to deliver the message, and he asks damages against the company in the sum of one thousand dollars for his mental distress and wounded feelings occasioned by this negligence. The question presented is whether an action can be maintained for this mental suffering. It is true that telegraph companies are liable for special damages occasioned by their negligence. Special damages are such as result not necessarily, but naturally and approximately. And the question remains whether mental suffering comes within the statutory rule. In many actions at law distress of mind becomes an important factor in estimating damages. Such damages enter into the recovery when the plaintiff has sustained, by the negligence or willful act of another, some corporal or personal injury; but mental suffering alone, unconnected with any other injury to the person, will not support an action. No case can be found when a person has been allowed to recover damages for a shock, injury or outrage to the feelings unaccompanied by an injury to the person. A different doctrine would lead to absurd and curious litigation. Take, for example, a railroad collision; it is proper that every passenger on the train who is personally injured should recover for the negligence, but shall every one who was frightened by the collision maintain an action against the company? [3d Sutherland on Damages, 715; Russel vs. Western Union Telegraph Co., 18 Reporter, 206.]

"In a proper case, the sender of a message may recover the statutory penalty of one hundred dollars for negligence on the part of the telegraph company, but the statute does not authorize the receiver of the message to recover this penalty. For the reason indicated, the defendants' demurrer to the complaint is sustained."

It is fair to say, in justification of the Western Union, that the message was taken to 611 Main street, the address given, and the party, before that time, had moved to another part of the city, and could not, therefore, be found by the messenger.

The Cullom Postal Telegraph Bill

Senator Cullom has introduced a postal telegraph bill. It provides for the purchase of any existing lines under the provisions of the act of 1866 at the appraised valuation to be ascertained by a commission of five disinterested persons. The bill proposes the purchase of existing lines when this course may be deemed advisable, under certain limitations as to the price to be paid. It recites a provision of the act of 1866 to aid in the construction of telegraph lines as follows: "The United States may at any time after the expiration of five years from the date of the passage of this act, for postal, military or other purposes, purchase all the telegraph lines, property and effects of any or all of said companies, at any appraised value to be ascertained by five competent, disinterested persons, two of whom shall be selected by the p ostmaster-general of the United States, two by the company interested and one by the four so previously selected." Senator Cullom's bill then provides that the secretary of state, secretary of war and postmaster-general shall constitute a board to be known as the postal telegraph commission, which is authorized and directed to purchase and acquire for the United States army existing lines under the provisions of the act of 1866, and subject to the approval of the President. It is expressly provided that no line shall be purchased until it has been shown to the satisfaction of the commission that such line has earned enough during the twelve months prior to the passage of the act to meet the necessary expenses of its maintenance, reconstruction and operation. Before any line is purchased, the commission is directed to ascertain its actual value, which is to be computed on a basis of $1,000 for every $50 net annual earnings, and it is provided that no line shall be purchased at a higher valuation than that ascertained upon the basis thus prescribed. To pay for any lines that may be acquired, it is proposed that 30-year 3 per cent. bonds shall be issued, which shall not be disposed of at less than par. The remaining provisions of the bill in relation to the extension and operation of lines that may be acquired are similar to those contained in Senator Edmunds' bill, and Senator Cullom states that his purpose in presenting his measure is that the Post-Office Committee investigating the subject may have both methods that have been suggested for the establishment of a

postal telegraphic system affirmatively before it for consideration. The bill was referred to the Committee on Post-Offices and Post Roads, to be considered in connection with the bill on the same subject recently introduced by Senator Edmunds.

Static Electricity.

BY PHILIP ATKINSON, A. M., PH. D.

CHAPTER VII.

STATIC GENERATORS.

The only electric generators noticed thus far are the rods of glass, ebonite and sealing-wax, rubbed with silk, woolen or fur; but it is evident that for such work as the charging of Leyden jars and batteries, and similar experiments, we require generators of far greater capacity. But it was thought best to anticipate their existence, and defer their introduction till there had been a full consideration of the principles on which the various kinds depend; so that they might all be included in one comprehensive view, from which the merits of each and the principles of its construction could be more fully ascertained.

THE ELECTROPHORUS.—This instrument, invented by Volta, is one of the simplest forms of a static generator, but it is of great utility in furnishing an unfailing, though limited supply of electricity for numerous delicate experiments.

The following style, designed by the author, and represented by Fig. 27, makes a handsome, convenient and very efficient instrument.

On a wooden base, 13 inches square, constructed of layers glued together to prevent warping, is placed a thin sheet of brass of the same size, over which is placed a sheet of ebonite of equal size, $\frac{1}{16}$ of an inch thick, and both attached to the base by screws near the corners.

On the ebonite is placed a circular plate or cover, made of No. 20 sheet brass, 12 inches in diameter, perfectly flat, and having a round resistance rim joined to the upper surface. In its centre is an ebonite handle 7 inches high, and from its rim projects a goose neck, made of No. 8 brass rod, terminating in a half-inch brass ball, near which, on the

FIG. 27.—ELECTROPHORUS.

edge of the base is a brass strip, $\frac{3}{4}$ of an inch wide, connected with the lower plate.

The base may be made of metal, if preferred, in which case the lower plate and strip are unnecessary, the base itself taking the place of the plate.

In this instrument we have two conductors separated by a dielectric, the upper one insulated and the lower connected with the earth.

The cover being removed the dielectric is beaten briskly with a piece of catskin or other fur by which its upper surface is electrified and the cover is then replaced.

Suppose the charge to be negative, electricity having been removed by the fur, the same amount is attracted from the earth to the under surface of the dielectric and to the upper surface of the brass plate in connection with it, which thus become positive by induction.

The under surface of the cover also becomes positive and its upper surface negative.

Let a connection now be made between the lower plate and cover, by touching the strip and knob with the finger and thumb, or a small discharger, the electricity accumulated on the lower plate will pass to the cover, producing a shock if passed through the hand.

The cover thus becomes positive, but its charge is neutralized or bound by the negative of the dielectric. Let it be lifted off by the insulating handle, its charge being no longer bound, a discharge, producing a spark, an inch or more in length, takes place, when the knuckle or any conductor is presented to the knob, as shown in Fig. 28.

The removal of the cover with its positive charge, having left the upper surface of the dielectric negative, a positive charge is again attracted to the under surface and plate, as before; and the cover, having been discharged and replaced, the process may be repeated with the same results an indefinite number of times, and Leyden jars charged or other electric work performed.

Suppose the original charge to be positive, the same results occur in reverse order. Electricity having been imparted by the fur to the upper surface of the dielectric, the same amount is repelled from the under surface and plate, making them negative. The under surface of the cover also becomes negative and its upper surface positive. Connection being made as before, electricity passes from the cover to the lower plate, leaving the cover negative and its charge bound by the positive on the upper surface of the dielectric.

The cover being removed, and a conductor presented to the knob, a discharge takes place; electricity now passing from the conductor to the cover, instead of from the cover to the conductor as before.

The removal of the cover with its negative charge having left the upper surface of the dielectric positive, electricity is again repelled from the under surface and plate by induction, and the cover, having been restored to zero and replaced, the process may be repeated as before.

We see, then, that when the charge is negative, electricity is attracted from the earth to the lower plate, then passes to the cover, and then from the cover to the presented conductor; but when the charge is positive, electricity is repelled to the earth from the lower plate; then an equal amount passes from the cover to the lower

FIG. 28.—DISCHARGE OF ELECTROPHORUS.

plate, and the same amount passes to the cover from the presented conductor.

Hence, when the instrument *receives* a positive charge, it *gives* a negative charge; and when it *receives* a negative charge, it *gives* a positive charge.

It will also be noticed that the initial charge is given by friction, but all subsequent charges are obtained by induction.

If the cover be removed without first making connection between it and the lower plate, no charge will be found on it, since it has neither gained nor lost eletricity through any external source; and its own electricity being merely changed to the upper or lower surface by the positive or negative of the dielectric, is restored to zero when removed from that influence.

This connection may be made automatically by placing a short brass pin in a hole made through the dielectric, its upper end even with the upper surface, so that it shall touch the cover and also the lower plate. This makes the instrument more convenient for obtaining charges in rapid succession, but, when used to demonstrate the principles involved in its construction, as above, the pin should be removed.

The top of the handle should be grasped, when removing the cover, to prevent a partial discharge through the hand.

The electrophorus will retain its charge for months; and, like the Leyden jar with movable coatings, can be taken apart and put together again without perceptible

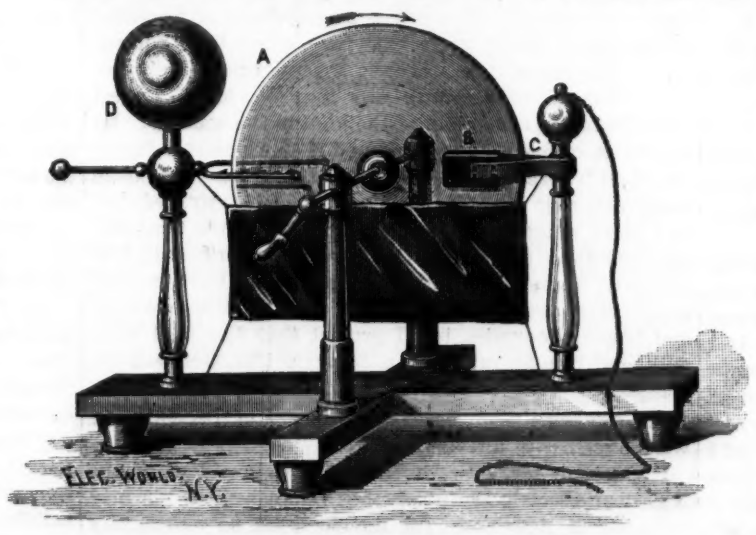


FIG. 29.—PLATE ELECTRICAL MACHINE.

loss of charge; but when not in use the charge is gradually dissipated, so that only a residual remains. Hence it should be charged again before immediate use, if great efficiency is desired.

This property of constancy probably suggests the name, electrophorus, electricity-bearer, from $\varphi\epsilon\rho\omega$ to bear, $\eta\lambda\epsilon\kappa\tau\rho\sigma\nu$ electricity.

THE FRICTIONAL MACHINE.—The principle of this machine is the same as that of the rod and rubber. It was invented by Otto Guericke, and consisted, at first, of a globe of sulphur, revolved on an axis by a crank, the hand being used as a rubber. Subsequently a globe of glass was substituted for the sulphur; but as insulation was disregarded in both styles, only feeble results were obtained, and the machines fell into disuse.

Boze, of Wittenberg, revived and improved them, using the glass globe and a band wheel and belt to increase their speed, and collecting the electricity on an iron tube, suspended by silk cords, from which hung a chain in contact with the globe.

Further improvement was made by the use of a leather rubber stuffed with hair, and subsequently the globe was replaced by a glass cylinder, on one side of which the rubber was mounted on a glass pillar; and, on the other side, similarly mounted, was a brass cylinder, called the *prime conductor*, from which a row of points projected towards the glass. An oil silk flap enveloped the upper part of the glass cylinder, and a chain was used to connect the rubber or the prime conductor with the earth, as desired.

The plate machine, invented about 1787, was constructed on the same principles, a glass plate being substituted for the glass cylinder, and has now come into general use. Fig. 29 represents one of the prevailing styles.

It consists of a disc of plate-glass *A*, mounted on a wooden base, with wooden or glass pillars, and revolved by a crank with an insulating handle. A pair of rubbers *B*, made of soft leather or felt, are pressed against the glass on opposite sides by a pair of brass springs *C*, the pressure being adjusted by a screw. These are mounted on a glass pillar, and connected above with a brass ball; and a brass chain, which may be removed, connects them with the earth.

Mounted on a glass pillar is the prime conductor *D*, made of brass, and consisting of a pair of balls, from the lower one of which projects a pair of combs, which extend on opposite sides of the glass, and whose teeth come within a quarter of an inch of it. And, from the opposite side of the same ball extends a rod, terminating in a small ball.

A silk cover envelopes the lower part of the glass plate, and the rubbers on the surfaces in contact with the glass, are coated with an amalgam, composed of five parts zinc,

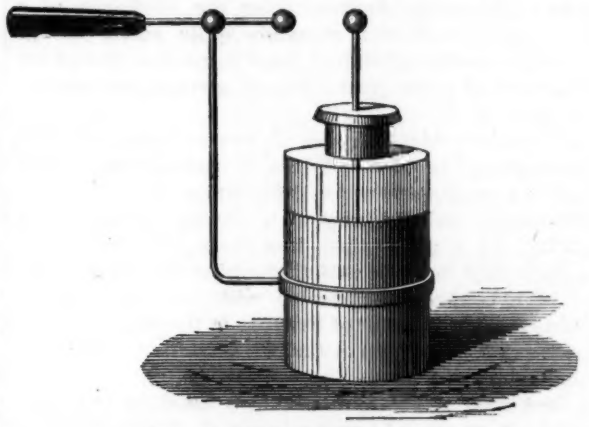


FIG. 30.—LANE'S UNIT JAR.

three parts tin, and nine parts mercury, melted together, pulverized, and made into a paste with lard.

The machine should be dry and warm before use, as moisture will condense on the surface of the glass when it is colder than the atmosphere, and would suspend insulation. For this reason ebonite pillars have an advantage over glass, being less liable to condense moisture.

Ebonite has also been used for the plate, but is not so reliable as glass; and its liability to warp with heat, when in thin plates, makes it very objectionable.

ITS MODE OF ACTION.—The plate being revolved in the direction of the arrow, electricity is generated by the friction of the rubbers; the charged surface of the glass passing directly into the silk cover, which prevents loss of charge from contact with the air.

If the charge on the glass is positive, when the charged surface comes opposite the combs, electricity passes through them from the plate to the prime conductor, where it accumulates.

The glass being thus discharged passes round again to the rubbers, which having become negative from parting with electricity to the glass, have received electricity from the earth through the chain.

Each portion of the plate is thus alternately charged and discharged as it passes first to the rubbers and then to the combs, the lower half being constantly positive and the upper half at zero, except the residual; electricity passing to the rubbers from the earth and being carried round by the plate to the prime conductor.

If the charge on the plate is negative, the transfer takes place in reverse order; electricity passing from the prime conductor to the plate, from the plate to the rubbers, and from the rubbers to the earth, the prime conductor becoming negative and the rubbers positive.

If the prime conductor be placed in connection with the earth by having the chain transferred to it, the charge, whether positive or negative, will take place on the ball and other parts connected with the rubbers.

If the prime conductor and rubber be connected by the chain, no charge can occur on either, since electricity constantly passes from one to the other through the chain, as it is generated.

If the chain be removed entirely, only a very limited charge can occur, derived from the material of the machine itself.

The limit of the charge is reached when its potential energy, whether positive or negative, so far exceeds the

resistance of the air, that the loss of charge by convection, as explained on page 131, Vol. VI., shall equal the energy generated.

When the atmosphere is damp, or its electric potential low, this limit is soon reached; but when dry, and at a high electric potential, a much greater charge can take place.

MACHINE DESCRIBED BY NOAD.—The largest machine of this kind of which we have any record was made some years ago for the Panopticon of Science in London. According to Noad, it had a plate ten feet in diameter, three pairs of rubbers, each three feet in length, and a pear-shaped prime conductor, six feet in length, and four feet in diameter at its widest part.

It was operated by steam power, and gave sparks 15 to 18 inches in length, and charged to its full capacity, in less than a minute, a Leyden battery of 36 jars, having 108 square feet of coated surface.

MEASUREMENT OF ENERGY.—The amount of electricity which a well-constructed machine can generate is in proportion to the surface area of the plate, which may be increased to any practicable limit, the other parts being increased in like proportion. It is roughly estimated by the number of sparks of a given length and energy which can be obtained in a given time, when an uninsulated conductor is brought near the prime conductor; or by the length of time required to charge a Leyden jar or battery having a given amount of coated surface.

The results are only approximate, especially those by the first method, for the following reasons. Length of spark is not a true index of energy, since a short, thick spark may have greater energy than a long, thin one, and our estimate of the comparative energy of each from its appearance, and the accompanying snap is liable to be very inaccurate. The spark accompanying the discharge of a Leyden jar or battery is generally quite short, though its energy is often a hundred times as great as that of any single spark of much greater length, given by the machine in charging it.

The humidity of the air and its electric potential being liable to great variation, produce a corresponding variation in the results obtained at different times.

The charge and discharge of a Leyden jar of a given capacity, in a given time, is a more reliable method. The jar should be made self-discharging by bringing the knob of a conductor connected with its outer coating, within sparking distance of the knob of the jar.

Lane's unit jar, shown in Fig. 30, is constructed on this principle.

A bent brass rod is connected by a band to the outer coating; its upper end terminating in a ball through which passes a horizontal sliding rod, terminating in a ball at its inner extremity, and having an ebonite handle at its outer extremity, by which the ball can be adjusted to any required distance from the knob of the jar.

To estimate the comparative energy of different machines, a uniform rotation of the plates must be maintained by a given number of revolutions per minute; and the number of discharges in a given time, of the unit jar, connected with the prime conductor, will then be approximately correct for the energy of each.

(TO BE CONTINUED.)

Positive Denials from Mr. E. H. Goff.

Mr. Edward H. Goff has addressed a letter to the press of the United States regarding the recent reports with reference to himself, which have been circulated from Canada. Mr. Goff makes the following statement:

"First—Because the dispatches themselves carry their own condemnation on their face, and to the intelligent reader expose the real object for which they are sent broadcast over the length and breadth of the land.

"Second—Because I desire a rigid andintelligentsifting of this whole matter from its foundation upwards, and much prefer that it be done by some competent expert or legal tribunal, rather than through the newspapers. If I thought the issue could and would be immediately brought before any fair and competent tribunal, so that the real facts could be ascertained, independent of myself, and made public, I would not have written this letter; but I am in receipt of so many letters and telegrams from friends in all parts of the country, urging me to publicly assert myself, that I find it a matter of necessity, in justice to my business and its varied associations, to make the following brief statement:

"*First.*—The story of 'forgery,' 'misappropriation of funds' and 'indebtedness' to the Canada Agricultural Insurance Company, of Montreal, is a tissue of falsehoods from beginning to end.

"*Second.*—The charge of forgery is simply nonsense, and the only ground upon which my accusers even dare base a claim of this kind is the fact of my having drafted in pencil the form of a resolution which had been passed by the directors, and spread upon the records by the secretary, authorizing me to make drafts upon the company for $22,700, money which I had loaned it months before and given it the use of without interest or remuneration of any kind. Instead of making drafts for the entire amount of my credit, viz.—$22,700.17, I drew only for $19,000, leaving a balance which has never been paid and is still due me, with interest, from July 17, 1877.

"*Third.*—I did not, and never did, owe the company one dollar. On the contrary, it was nearly always in my debt, and now owes me $3,700.17 and interest, as above stated, in addition to about a year's unpaid salary, with interest, all of which I am fully prepared to substantiate. The only ground which the Assignees of the company have for claiming that I am indebted to the company is by the directors and assignees voting to make calls on stock which I held in the company, and in this way they may make me out their debtor by a process of voting to any amount they may choose.

"I now repeat what I have said to the Assignee of the company many times: If I owe the Canada Agricultural Insurance Company any amount, large or small, I am ready and willing to pay it, and always have been, but not upon the showing of corrupt Assignees, who were placed in their position by political adversaries for the purpose of using the company as a political inquisition. I have many times asked and demanded as my right that the company's accounts should be submitted to competent expert accountants, to be selected in the usual manner, for arbitration, which has always been peremptorily refused. This whole business is now revived by a few political enemies in Canada who have joined hands with certain of my business rivals in Boston and New York, in the hope, on the one hand, of extracting money from me and also to punish me for exposing the dishonest and corrupt practices of the Quebec politicians, and, on the other hand, to injure the business I am associated with. This plot has been assiduously worked up by numerous trips of these men and their emissaries from Boston and New York to Montreal during the past six months, the facts of which are well known, and as notorious on the streets of Montreal as the fact is well known here that the charges have been made against me.

"I have been in active business for twenty years, occupying many responsible positions, and the man, woman or child does not live in this or any other country who can sustain the charge of dishonest or unfair dealing against me. I cannot think that the American people are ready or willing to believe the slanders cast upon an American-born citizen, living and doing business among them, based upon an exploded political charge of eight years' standing."

The "Man About Town" of the New York *Tribune* says: "I am surprised that no American paper has denounced the attempt to secure the extradition of Edward H. Goff, President of the American Electric Manufacturing Company, of this city. Canada never gives up our criminals. We have heretofore been too ready to send them back any citizen whom they accuse. Mr. Goff is an American citizen and a soldier, who has for eight years been in business in Boston and this city, associated with prominent men and corporations; yet certain political enemies in Canada ask us to give him up on a charge eight years old, and never urged in their own courts, of forgery in drawing up a resolution to be entered upon the minute-book of an insurance company in Canada. I am informed, on excellent authority, that this prosecution is actuated in some measure by the revengeful spirit of the Canadian politicians whom Mr. Goff was instrumental in driving from power years ago. They seek to use our laws to do what they failed to do in their own courts. But I also learn that rivals in business of Mr. Goff are urging on the prosecution to injure him and the company he represents. Mr. Goff several years ago began in business in Boston the manufacture of electrical appliances of almost every kind for electric light companies. His corporation absorbed several others and combined with still others, until now it is one of the largest manufacturing companies of the kind in the country. Its development has been so rapid and is continuing so favorably that it threatens, so its rivals fear, to lead the entire manufacturing business in this line. It is reported that two rival companies have combined with the Canadian prosecutors to injure Mr. Goff and his company in this manner. Some of the daily papers here have unwittingly been used to further the ends of these political and business enemies, but I predict that the final issue will be of benefit rather than injury to Mr. Goff and his company."

The following from the Boston *Courier* of December 27 will be read with interest:

"Although Mr. Edward H. Goff, the President of the American Electric Manufacturing Company, has recently removed to New York, yet he has been so extensively engaged in the business of electric lighting in Boston, where his interests are very large, that he is still to be regarded as a Boston man. The recent threat, therefore, of certain Canadian officials to attempt to secure his extradition on a charge of forgery excites among the friends of Mr. Goff great indignation and contempt. If Mr. Goff is the great rascal they say he is, it would seem that there are now plenty of American felons who find a safe haven in Canada without their seeking any more. At least some equitable system of exchange ought to be arranged. But the charges against Mr. Goff all fall to the ground, for the reason, first, that they are eight years old and the instigators have waited until he was prosperous before pressing them; secondly, that they have suggested that a settlement could be effected by the payment of money. This, if carried out, would be a compounding of felony, which no officer would dare attempt; and it brands the whole affair as a blackmailing scheme. Mr. Goff's manly and explicit letter in another column should set the matter at rest forever."

The Richford (Vermont) *Gazette*, in its current number, thus alludes to the recent charges against Mr. Goff by his Tory friends in Canada. The *Gazette* says:

"The charges are simply absurd, and were the outgrowth of the hot political fight in the Province of Quebec, which resulted in the defeat of the corrupt De Boucherville ministry and triumph of the Liberals in 1878. This result was brought about by the disclosures of Mr. Goff, which connected the Hon. G. B. Baker, of Sweetsburg, then Solicitor-General of the province, with the scheme for plundering the Montreal, Portland & Boston Railway by retaining a large portion of the subsidy granted that road, of which Mr. Goff was president. Upon the defeat of the De Boucherville ministry at the polls, the leaders of the Tory party in Quebec set about to encompass Mr. Goff's ruin, and charges of forgery, embezzlement, etc., were brought against him. A willing tool was found in the person of a Montreal police justice, who conducted an ex-parte hearing, and without giving Mr. Goff a chance to establish his innocence bound him up for appearance before the Grand Jury. As a reward for his part in the game this justice was shortly afterwards made a judge. With means exhausted and despairing of justice, Mr. Goff left Montreal and went to Boston, where he has since resided. Heretofore no attempt has been made to secure his extradition, and this eleventh hour proceeding against him is said to be due to the managers of rival electric light companies who are jealous of Mr. Goff's success and are endeavoring to break him down. Proof of the conspiracy is furnished by the fact that although Mr. Goff is accused of embezzling $300,000, the Canadian lawyers, who claim to represent the insurance company, offer to settle for $7,500 and discontinue all proceedings against him. We understand Mr. Goff refuses to pay any sum in settlement, and will vigorously fight any attempt to secure his extradition. The probability is that no such attempt will be made, but if it is the Canadian lawyers may find different ideas of justice prevailing in the United States from those which notoriously obtain in Montreal."

The St. Johns *News*, published at Montreal and St. Johns, Que., and one of the oldest and most respectable Conservative newspapers in the Province of Quebec, in alluding to this matter, says:

"The assignees and some of the stockholders of the defunct Canada Agricultural Insurance Company have suddenly awakened to the consciousness that Mr. Edward H. Goff, the ex-manager of the company, 'is in the United States;' that he is 'living luxuriously,' and that he is a fair subject for 'bleeding' at this festive season; hence they are going him."

Indictments which have lain dormant for eight long years have been resurrected, and are to be made the basis of the demand for Mr. Goff's extradition.

It is impossible to say now what the result will be, beyond the fact that our legal friends will turn a petty penny out of the affair.

The New York *Daily Graphic* says:

"We publish elsewhere the answer of a prominent business man of this city to the charges made against him in the daily papers, which now appear to have emanated from enemies of his in political and business circles in Canada. The charge of forgery against Mr. Goff seems to rest upon a very slender foundation, for, as he explains in his letter, he drafted in pencil a resolution passed by a Board of Directors authorizing him to make drafts on the company for a large amount. This, then, is the 'forgery,' and a very weak charge it is upon which to ask for a man's extradition. Mr. Goff, it appears, while resident in Canada some years ago, took an active part in politics and succeeded in breaking up a ring which had dominated that section for years. They never forgave him, and this latest slander is apparently circulated for revenge."

The Providence (R. I.) *Star*, of Dec. 23, says: "The experience of Mr. Edward H. Goff, of New York, is an illustration of the evil which may be done by the hasty and thoughtless publication of pretended news. In Mr. Goff's case the plan appears to have been deliberately laid to ruin his reputation by spreading broadcast through the press charges of an injurious character. It can hardly be said that the attempt has succeeded, for his answer, apparently satisfactory and complete, followed close upon the heels of the libel.

"No respectable newspaper will knowingly lend its columns to any such wicked uses. But newspapers are quite liable to be deceived by irresponsible, malicious and worthless correspondents, perhaps made the tools of cunning, artful persons, who have an object in injuring some business concern or some private individual.

"As a rule, however, it is simply necessary for the person aggrieved, or who has reason to apprehend that he is to be assailed, to lay the facts plainly and candidly before the editor of the newspaper, and the shrift of that correspondent will afterward be materially abbreviated."

A New Year's Present.—The following cheerful notice has been sent to all members of the T. M. B. A. by Mr. Bruch, the Secretary: As the Treasurer has enough funds to meet all claims, the Executive Committee has voted to pass the monthly assessment issuable on Jan. 1, and to levy the next assessment on Feb. 1.

The Western Union's "Peace and Good Will."

Christmas Day in New York saw a partial repetition of the Western Union's tactics toward the late Bankers and Merchants' Company. On Christmas morning George Crouns, a lineman employed by the United Lines, was riding down town on a street car through West Broadway. He was surprised to see a gang of men, whom he recognized as Western Union linemen, at work taking down the very wires which he had helped to string only a few days before to connect the commercial tickers at the Hoffman House. Crouns got off the car and watched the Western Union men. He saw them cut the United Lines wires, remove them from the cross arms, throw them to the street, twist them up in a snarl and toss them into a wagon. The Western Union men began cutting the wires at Chambers street. They went along West Broadway and along the route of the United Lines to Twenty-fifth street and Seventh avenue, climbing poles and housetops and destroying the wires as they went. The wagon followed behind, and the injured wires of the rival line were tossed into it. Presently the wagon drove away with its load of stolen goods.

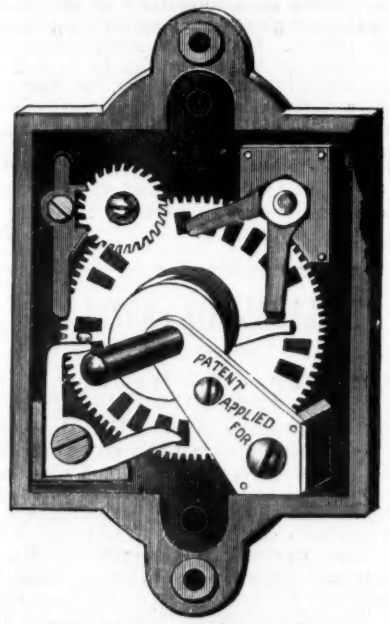
The employé of the United Lines, after he had seen the last of Mr. Gould's marauders, hastened to the Hoffman House and informed E. S. Stokes, President of the United Lines. That energetic gentleman promptly sent for a gang of linemen and set to work connecting another set of wires with the uptown Commercial tickers. They worked all day and night, and the next morning, when the Stock Exchange opened, the Hoffman House customers of the Commercial Telegram Company received their quotations as usual.

The motive for the raid is said to be that these wires were strung on American Rapid poles, but that assertion is denied by the United Lines Company.

New Messenger Call Box.

The accompanying cut gives a very good idea of the new district messenger call box which is being extensively manufactured by the Electrical Development and Manufacturing Company of Boston.

As will be seen, its chief feature of improvement consists in combining the main train and break or signal wheels in one. Further, by thus arranging the mechanism, many gear wheels are avoided, lessening friction and thus making a steadier and easier running box, and materially reducing the liability to accident. There is a double contact cut-out which insures a closed circuit when the box is at rest.



NEW MESSENGER CALL BOX.

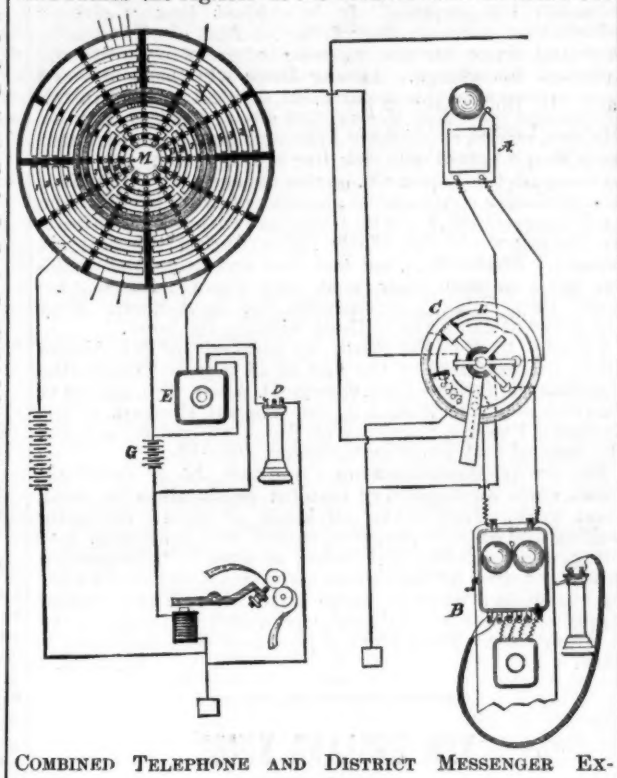
The absence of internal wiring and the improved insulated brush post are also novel and efficient points.

A Combined Telephone and District Messenger Exchange System.

As employed at present the telephone and district messenger services require distinct circuits and apparatus. In the latter service, also, communication is possible only in one direction, *i. e.*, from the subscriber to the district office. It is evident that if communication were possible in both directions a messenger might in many cases be sent upon his errand without calling upon the subscriber and learning his wants, and thus considerable time would be saved. These considerations have led Mr. John A. Seely, of this city, to devise a system which was patented Dec. 8, and in which the telephone is combined with the district messenger service. Communication in both directions is effected by the transfer of the telephonic apparatus into the circuit of the district telegraph or messenger system, while at the same time it leaves both circuits complete and independent, so that signals may be conveyed on both.

The accompanying illustration shows the general arrangement of the circuits of the subscriber and the central office.

The telephonic apparatus *B* is connected to a peculiar switch device *C*, at the subscriber's office; and at the central the telephonic apparatus for communicating with the subscriber is shown at *DE*. There is also situated the ordinary Morse register used on district messenger circuits, and the switch-board *M*. The switch *C*, above referred to, is provided with a lever and suitable contact points, so that when in the position shown in the illustration the telephonic apparatus alone is in circuit and entirely distinct from the other. When it is desired to call a messenger, the lever is turned to the left, and in doing so it makes successive contacts with a number of buttons (shown in dotted outline) placed in the messenger call circuit. This causes the register at the district office to mark the



COMBINED TELEPHONE AND DISTRICT MESSENGER EXCHANGE SYSTEM.

breaks which occur, and according to the spacing between these buttons the number of dots and dashes will vary, so that the calls can be distinguished from one another. By means of the switch-board *M* the telephone apparatus at the central station can then be included in the circuit and communication established between both parties, as will be seen by tracing the circuits. The nature of the service required can then be ascertained. But while the telephone apparatus is included in the district telegraph circuit, it is important that the exchange circuit shall not be opened, and in case communication might be desired with the subscriber by other subscribers connected with the telephone exchange, it is desirable that a means of signaling be available to notify the subscriber that telephone communication is desired with him.

For this purpose the bell *A* is provided, which is automatically included in the district messenger circuit by the movement of the switch lever.

If while the subscriber is using the telephone apparatus to communicate with the district messenger office, he hears the bell *A* ring, he knows at once that telephonic communication is desired with him, and when his communication with the district office is ended the lever is moved back to its original position, by which the telephone apparatus is again switched on to its normal circuit, as before.

A Bad Fire.

A disastrous fire broke out in C. E. Jones & Bros.' extensive plating works and manufactory of electrical instruments, on the fourth and fifth floors of the building 145 and 147 Walnut street, Cincinnati, during the afternoon of Dec. 13. The flames, the exact origin of which is unknown, were first discovered when dense volumes of smoke burst from the front windows on the fifth floor. A district messenger boy who happened along gave the alarm, and box 34 at Fourth and Walnut was pulled. When the department arrived a few minutes later, the fourth and fifth floors were a roaring furnace. A second alarm was then sounded. It was some time before the torrents of water which were poured into the building had any effect whatever, and then only when the fire had virtually burned itself out. Jones Bros.' establishment became a total wreck. Of the numerous machines and other appliances used in carrying on their extensive business, nothing remained but a conglomerate mass of iron, ashes and rubbish. The fifth floor was used as a brass foundry and plating works. A furnace for melting the metals used was located in the rear, and from this the fire is supposed to have originated, notwithstanding the fact that the fire was supposed to have been extinguished in it late Saturday afternoon. The firm had on hand a large stock of fine plated goods, besides electrical instruments and wire. Most of the stock was stored on the fourth floor, and was totally destroyed. A $2,500 consignment of heavy insulated copper wire, which had been ordered by the Brush Electric Light Company, had just been received, and was on the fourth floor. It went up with the other stock. An electrical clock in the office, which is in the Carlisle building, separate from the factory, was stopped at exactly 1:27, when the wires connecting it with the apparatus in the factory were severed by the fire. Mr. Will Jones stated that their loss would be between $15,000 and $20,000. Their factory is an entire loss. On this there is $8,000 insurance, divided among the following companies, who each carried $1,250 on stock and $750 on machinery: Citizens', of Pittsburgh; Fire Association, of Philadelphia; Western, of Toronto, Can., and the Louisville Underwriters. The fire will greatly disturb for a time the business of the firm, who were already preparing for the spring demand for their goods. They were fortunate in getting out a $1,200 order just before the fire broke out. On June 11, 1883, the firm were severely crippled by a fire which did considerable damage, but was slight compared with the damage of this. We are very sorry for the firm in their heavy misfortune, but we know they have the grit to pull themselves together again in a very short time, and go on almost as if nothing detrimental had happened.

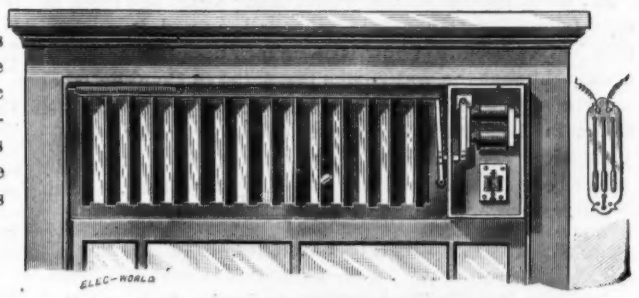
An Important Ruling in the Stearns Duplex Suit.

Last summer the Western Union Telegraph Company applied to Judge Wallace, of the United States Circuit Court, for a preliminary injunction to restrain the Baltimore & Ohio Telegraph Company from the use in its quadruplex service of the patent obtained by J. B. Stearns in 1872, which had been twice reissued to the Western Union Company, the last reissue being ten years subsequent to the date of the original patent. One of the affidavits of the Western Union in support of the motion contained an extract from a report, which had been made to the company by its patent expert and attorney, Mr. C. L Buckingham, in 1881, when the subject of applying for the last reissue was under consideration by the company. Judge Wallace denied the motion of the Western Union Company, and in the hearing of the case, which is now going on, the Baltimore & Ohio Company's counsel applied to the Court for an order compelling the Western Union Company to produce the full report of Mr. Buckingham referred to.

This application was strenuously resisted by the Western Union Company, for the reason, as supposed, that the report contained other matters not relevant to the issue, or which if made public would reveal the purpose for which applications for the reissues were made. Judge Wallace has granted the motion of the Baltimore & Ohio Company. The judge says that the defendant is entitled to put in evidence any document or affidavit which has been used by the complainant in any proceeding in the suit for the purposes of interlocutory relief. By the production of such documents or affidavits as the basis for relief sought, the complainant has impliedly vouched for the truth of the facts recited in them, and they are admissible as the declaration of the complainant.

An Automatic Temperature Regulator.

The desirability of maintaining an equable temperature in rooms is too obvious to need any demonstration. At the American Institute Fair, just closed, there was exhibited an ingenious and simple arrangement to effect this equalization automatically by the aid of electricity. Our illustration shows the manner in which the desired object is accomplished. As will be seen, a wooden frame, which may be placed either in the upper or lower sash, is divided into alternate parts of glass and metal. The metal strips are pivoted at each end and all attached to one metal bar, which is connected at one end of the frame with the armature of an electro-magnet, covered by a wooden box, and the other end is drawn back by a spiral spring. The thermometer has a wire let into the bulb, and also one fused into the glass tube at any desired degree. The electro-magnet, thermometer, and battery are connected by insulated wires, and the operation, therefore, will be readily understood. The mercury in the tube, acting as part of the conducting wire, will, as it rises and falls, connect and disconnect with the wire fused in the side of the tube, thus alternately attracting and releasing the armature, and thereby opening and closing the movable slats in the frame. It has been practically demonstrated that by the use of this instrument any apartment which is artificially heated may be kept for days at a temperature which will not vary more than one degree.



AN AUTOMATIC TEMPERATURE REGULATOR.

Mr. Chas. A. Tucker, of Brooklyn, N. Y., is the inventor of this apparatus, which is valuable not only for the ventilation of private residences and public buildings, but also in the maintenance of a steady temperature, either high or low, in warehouses, breweries, and other large industrial establishments.

"The Things that are Cæsar's."

To the Editor of The Electrical World:

SIR: It is somewhat amusing, just at the present stage of electric light growth, to notice the quiet assurance with which the Thomson-Houston Electric Company lay claim to the fruits of the efforts of others. In your article of last Saturday on the "Advance of Electric Lighting in 1885," they are credited with the following installations made by the American Company, aggregating 20 per cent. of the entire new business under these patents, during the year just closing, throughout the United States:

Bangor Electric Ill. Co.	Bangor, Me.	114 lights.
Springfield Electric Light Co.	Springfield, Mass.	181 "
North Adams E. L. & P. Co.	North Adams, Mass.	38 "
Norwich Electric Light Co.	Norwich, Conn.	76 "
Brookline E. L. Co.	Brookline, Mass.	90 "
Pittsfield Electric Light Co.	Pittsfield, Mass.	90 "
Poughkeepsie Electric Light Co.	Poughkeepsie, N. Y.	79 "

Also the following growth in plants established by us, 28 per cent. of their entire increase in this country:

Consolidated E. L. Co.	Portland, Me. / Old Orchard, Me.	85 lights.
Lewiston & Auburn E. L. Co.	Lewiston, Me.	45 "
Merchants' E. L. & P. Co.	Boston, Mass.	92 "
Worcester E. L. Co.	Worcester, Mass.	90 "
Middlesex E. L. Co.	Lowell, Mass.	50 "
Wachusett E. L. Co.	Fitchburg, Mass.	19 "
Narragansett E. L. Co.	Providence, R. I.	295 "
Hartford E. L. Co.	Hartford, Conn.	188 "

We would not in the minutest degree detract from the credit due our *valued friends* and former business associates of the Thomson-Houston Company, but we simply ask for this qualification of their statement in justice to the American Company, through the outcome of whose policy, and by the use of whose capital as a construction organization, the progress which they have summarized has become possible.

EDWARD H. GOFF,
President Am. Elec. Mfg. Co.

NEW YORK CITY, Dec. 28.

Benjamin Franklin's Watch.

Levi W. Groff, an old farmer of Lancaster, Pa., has been visiting this city and shows with pride a relic of over a century ago in the shape of a heavy silver watch once worn by Benjamin Franklin. The watch is of silver and has an open face, while on the back is engraved the words:

BENJAMIN FRANKLIN,
1776,
Philadelphia.

Inside the cover at the back is an old-fashioned jeweler's card showing that the watch was repaired Jan. 24, 1817, by Thomas Parker, of Philadelphia. On the heavy gold face the words "W. Tomlinson, London. 511," show where the timepiece was made. Little of the history of the watch is known except that after Franklin's death it was worn by his son-in-law, Richard Bache, who lost it in a Philadelphia hotel while on a visit from his homestead in Bensalem, Bucks County, Pa.

Mr. Groff purchased the watch many years ago from an aged friend, long since dead, who had owned it so long that he had forgotten how it came into his possession. It is thought that the watch was presented to Franklin when he represented the Independent Colonies in the British Court in London. The watch has been in Mr. Groff's possession nearly thirty years, during which time it has never been repaired and still keeps accurate time.

Electric Launches.

In June last Mr. Reckenzaun took the Duke of Bedford, accompanied by Lord Sudeley, for a cruise in the electric launch "Australia," the duke's magnificent steam yacht "Northumbria" being at the time anchored off Gravesend. The Duke was so pleased with the performance of the "Australia" that he decided to order a boat of similar design, but of more elegant appearance, and the Electrical Power Storage Company was intrusted with the construction of the propelling apparatus of this new vessel, which is some three feet longer than the "Australia;" the internal arrangements, however, are very similar. Twenty-nine E. P. S. accumulators are placed in a box in the centre of the boat, this box serving as a seat for passengers; the cells actuate a "Reckenzaun" motor, and the speed obtained is of the average rate of six knots per hour for 4½ hours. The accumulators of this boat serve also for lighting the yacht when the electric launch is suspended from the davits, and the cells are charged from the dynamo which usually lights the "Northumbria." The official trial took place recently, at Westminster, in the presence of numerous spectators. We learn that Mr. Reckenzaun has at this moment several designs of electric boats in progress, which will embody further substantial improvements. One of these is being executed to the order of the Italian government, and a second for an Indian prince; the former is for war purposes and the latter for pleasure. The prince's launch is to be fitted most luxuriously, and electrically lighted, even the fans being actuated by electricity.—*London Elect. Rev.*

Why not rig up an electric fishing tackle for the Indian prince, with an incandescent lamp as a bob, and a little motor to wind up his reel

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL WORLD,
Dec. 30, 1885.

The success of the incandescent light being thoroughly established, the question of wiring has now become very important, and the running of the circuits is a material item in the construction of all first-class buildings. So much is this the case, that builders now, as a rule, include wiring in the estimate of cost for new contracts. It is, of course, necessary to perfect beauty of work that the buildings should be wired before completion, as the circuits can then be placed entirely out of sight and at much less expense. It is evident that "wiring" indoors thus becomes one of the leading electrical arts, affording scope for the exercise of great ingenuity and technical knowledge. Among those who have devoted their attention to this department of electric light installations as a specialty, Messrs. Noll Bros., 65 Fifth avenue, this city, stand prominently. The firm have been organized since March 1, 1885, and for five years previous were connected with the Edison Co. in this capacity, and they have already done a considerable quantity of work in wiring on the Edison system, for which they are authorized contractors, having wired for 15,000 lights during the past six months. Electricians, not less than architects and builders, must admire their neat and clean methods, because they help to recommend the light itself. They will forward catalogue to those wishing the same.

I regret to note the death, by paralysis, of Mr. Abram Allen, in Brooklyn, at the age of 75 years. This gentleman was the father of Mr. George D. Allen, well known to the readers of the WORLD as the General Manager of the Excelsior Electric Company of Brooklyn and New York. The funeral took place on Saturday, December 26.

The Swift Manufacturing Company, of 18 Cortlandt street, show me some very tasteful productions in small wood work. They make all kinds of nested boxes for mailing and express purposes, square sets, long sets, deep sets, general packing, and in fact all sizes for light mailing as now required by the numerous electrical industries turning out small articles in large quantities. The company supply one gross in small size, and a half or quarter gross in larger sizes. Their work is good and very moderate in price.

W. T. H.

NEW ENGLAND NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
BOSTON, Dec. 28, 1885.

The Citizen's Electric Light Company, the incorporation of which has already been announced in this column, proves to be merely a reorganization of the old Union Electric Light and Power Company, operating a plant in East Boston and Chelsea. Since July 1st that plant has been operated in connection with that of the Merchants' Electric Light and Power Company, of this city, under a working and pooling arrangement. It was proposed to put both companies into the general consolidation of Boston electric lighting companies, but that scheme having failed through the refusal of the Thomson-Houston Company to put in the same territorial rights for the Merchants as were given by the respective parent companies to the Brush and Weston, it was deemed best for both companies to resume their independent operation.

The Union Company has now reorganized under the Massachusetts law, with its capital scaled down to $45,000 and with the same stockholders and officers.

The Winthrop town meeting was held on Tuesday evening, Dec. 22, at the town hall of that lovely little Massachusetts centre of enterprise and business activity, and among the important business was a vote favorable to the Enos Electric Railroad Company, as follows:

Resolved, That this meeting favors the granting to the Enos Electric Company a right of way in Winthrop over the route asked for, that is to say, over Main, Shirley, Herman, Winthrop and Pleasant streets and Washington avenue and bridge, provided that if said road be not built and operated satisfactorily within one year from the date of its charter such right of way shall be void and forfeited, and provided also that the road over the route be completed within such time.

On Jan. 5 the Baltimore & Ohio Telegraph Company move into new quarters, No. 27 Bedford street, Fall River, Mass., on account of increasing business. Mr. E. B. Vosburg has been appointed Manager, and Superintendent C. J. Sheehan predicts the outlook for his company in that section as very encouraging.

On the evening of Dec. 24 the streets of Lawrence, Mass., were lighted for the first time with electric light, the system used being the Edison, the lights being incandescent.

The lights, which are placed on high poles, are of 16 candle-power in the principal streets and 10 candle-power in other places.

Report comes from Lowell, Mass., that the stock of the Erie Telephone Company, which has been growing in favor for several weeks, will receive an important impulse to higher prices. It is reported that a settlement of the suit of the Erie Company against its old officers has been made, by which the Erie will receive between $30,000 and $40,000. The receipt of this money will nearly cancel all of the indebtedness of the Erie.

In the compilation of new plants installed during the present year by electric lighting companies, as published in THE ELECTRICAL WORLD, page 262, issue of Dec. 26, the isolated installations made by the Thomson-Houston Electric Company since Jan. 1, 1885, were accidentally omitted. They are as follows:

Fitchburg Worsted Company, Fitchburg, Mass.
Carew Manufacturing Company, South Hadley, Mass.
Geo. H. Gilbert Mfg. Company, Ware, Mass.
T. J. M. Smith & Co., Boston, Mass.
W. S. Butler & Co., Boston, Mass.
Steeve Worsted Mills, Providence, R. I.
Windsor Locks Steel Company, Windsor Locks, Conn.
Esperanza Marble Company, Rutland, Vt.
Riggs House, Washington, D. C.
National Hotel, Washington, D. C.
Lansburgh Brothers, Washington, D. C.
Woodward & Lothrop, Washington, D. C.
Globe Woolen Mills, Utica, N. Y.
Auburn Woolen Company, Auburn, N. Y.
Rodgers, Shanley & Farrell, New York Aqueduct, N. Y.
Elmira Rolling Company, Elmira, N. Y.
J. H. Bunnell & Co., New York, N. Y.
Flanagan & Russell, New York Aqueduct, N. Y.
Collins & Farwell, New York Aqueduct, N. Y.
Rider & Dougherty, New York Aqueduct, N. Y.
Denton, Brenchard & Co., New York Aqueduct, N. Y.
Midvale Steel Works, Nicetown, Philadelphia, Pa.
Pencoyd Iron Works, near Philadelphia, Pa.
Baldwin Locomotive Works, Philadelphia, Pa.
Delaware Rolling Mills, Philadelphia, Pa.
W. C. Allison & Son's Car Shop, Philadelphia, Pa.
Chas. Spencer & Co., Knitting Mills, Germantown, Philadelphia.
Phœnix Iron Co., Phœnixville, Pa.
Lackawanna Iron and Steel Co., Scranton, Pa.
Chester Rolling Mills, Chester, Pa.
Cambria Iron Company, Johnstown, Pa.
Keystone Bridge Company, Pittsburgh, Pa.
Philadelphia & Reading R. R. Company, Reading, Pa.
Cumberland Valley R. R. Company, Chambersburg, Pa.
American Ship Building Company, Philadelphia, Pa.
Grand Lake Coal Company, Pittsburgh, Pa.
Continental Brewing Company, Philadelphia, Pa.
Firth & Foster Bros., Dyers, Philadelphia, Pa.
P. H. Glatfelter, Paper Mill, Spring Forge, Pa.
Ellithorpe & Co., Knitting Mills, Philadelphia, Pa.
Jas. Doak, Jr., & Co., Worsted Mills, Philadelphia, Pa.
A. B. Farquhar, York, Pa.
Michael Schall, York, Pa.
Schall & King, Middletown, Pa.
Giliser Manufacturing Company, Waynesboro, Pa.
H. Leh & Co., Allentown, Pa.
Edgemoor Iron Company, Wilmington, Del.
Stein Brothers, Cleveland, Ohio.
Morgan Engineering Co., Alliance, Ohio.
C. E. Rector, Chicago, Ill.
A. C. Huston, Chicago, Ill.
Blomgren Bros., Chicago, Ill.
Race Brothers, Chicago, Ill.
Upham Manufacturing Company, Marshfield, Wis.

I ought to mention that the Electric Gas-Lighting Company is pushing actively its new "single magnet" ratchet automatic burner. The claims made for this patented system are noteworthy. "It embodies the original Bean-Tirrell ratchet movement, simplified and perfected. It is a practical working device; is not affected by extremes of heat or cold; and when once properly adjusted, stays so. It responds with promptness to an electric impulse from either a weak or strong battery, while its commutator automatically cuts out the electric current when the lighting or extinguishing is accomplished, which saves grounding the battery by continued pressure or imperfect connections at the press-button. It is as small as an automatic electric gas-lighter and extinguisher and can be made to do practical work; it is so small as not to obstruct the light or throw shadows. There are no springs used *in* or *about* the valve; which, fortunately, does *not* operate by gravity, hence does *not* stick or leak; while its gas-way is *not* liable to be kept open by deposits of dust or gas tar. The gas cannot be accidentally let on by a jar or blow; nor can the gas passage be partly or wholly closed from the same causes. It has an independent gas-way; hence the flow does not pass over the helix and through the mechanism to its inevitable injury. It has a perfect gas key with a ratchet wheel securely attached to its spindle, which rotates under the vibrations of an armature having a panel attachment to its lower end, so that ample leverage and power is obtained to turn the key." It will be seen that these are good points, and the way the orders come in shows that the customers stand ready to indorse the claims made so confidently.

W. I. B.

PHILADELPHIA NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
PHILADELPHIA, Dec. 28, 1885.

As the first of January approaches there is much curiosity to see whether or not the city authorities will cut the wires. Meanwhile, the Western Union is removing its wires and chopping down the huge poles on Tenth street and between there and Broad street, where the new central office has been established. The Chief of the Electrical Department of the City Government, Mr. Walker, says that as the ordinance of June 11 has not been repealed, there is nothing left for him but to do his duty on the first of January. That ordinance provides that all telegraph and telephone wires that may be overhead in the old city limits on January first shall be "removed" by him. As he has already openly confessed that it is utterly impossible to bury the city's wires (fire and police connections) in the given time, it is hard to see how the city can insist upon the chartered companies doing so. The latter appear to pay very little attention to the matter, reasoning, very properly, that if the city wants to cut herself off telegraphically from the world at large, she is at liberty to do so, and thus create a riot among her business men. There would, of course, be some loss to the companies, but if the commercial interests of the city can stand it, if the newspapers can go without their news, and the entire business be brought to a standstill, the telegraph people can stand it, too. Let them cut. This is not the first time that the "City Fathers" have combined to ruin the city. Philadelphia was once the capital of the United States; she was the largest city in the Union, and her influence was greater than any other, but she had old fogy legislators and her commerce went to New York and Baltimore, the grain from the West was shipped to other ports, yellow fever decimated the town for five successive years, and now she proposes to drive out the telegraph, the telephone and the electric light, and build a Chinese wall around herself to keep out anything else new and useful. It will pay the various companies to telegraph all around Philadelphia, and let the business go to New York and Baltimore, as it has gone in years past.

Henry Clay, the inventor of the telephone system known as the "Clay Commercial," which was squelched by a legal decision, is now out with the idea of a gigantic system of electro-pneumatic transit, which he declares will revolutionize the present system of mail carriage and the transmission of intelligence by telephone. The scheme is one of vast proportions and elaborate detail, and is founded on a plan of transmission by pneumatic tubes controlled and governed by electrical appliances. The tubes are to be laid under ground. They will be made of brass, and

through them will be transmitted metallic carriers or receptacles adapted to the need of the business desired. At convenient points will be placed machines for introducing the compressed air that moves the metallic carriers, and also the electric current, which is a valuable adjunct of the pneumatic system of Mr. Clay. As the current of air travels through the tubes the carriers containing articles to be transferred are carried along with it. The plant, when fully established, will be worked on what will be known respectively as the consecutive special and exchange systems. These systems will be adapted for the transmission of mail between street letter boxes and post-offices; for special deliveries to and from certain points; for private consultation and the transmission of moneys, stocks and bonds between brokers and banks and business and manufacturing establishments; for the rapid delivery of packages from stores to districts nearest the address of the purchaser, and for the transmission of intelligence between police patrols and the central station.

The system differs materially from the present pneumatic tube systems in this particular, that whereas at present several tubes are required to run from one central point to those radiating from it, by the new arrangement of electrical devices and switches the carriers are sent from the main tube leading from the central point to the various branches, with a great saving of expense in tubing. One line of tube will suffice for all stations, just as do the water mains. Thus the promoters of this scheme hope to get even with the Bell Telephone Company, with whom they had such a great law suit last winter, since by this new system messages can be transmitted with so much greater speed, secrecy and general satisfaction.

A tremendous telegraphic business has been going on lately, on account of the mine accident at Nanticoke. At Scranton it is claimed that more business has been done there by the telegraph operators, in proportion to their numbers, than in any other office in the State. Some of them have worked eighteen hours out of the twenty-four.

At a little country town in Lebanon County, called Cornwall, a good example is being afforded of the great popularity of the electric light. Robert H. Coleman gave every man, woman and child in his employ an invitation to spend part of his Christmas at his palatial home. A tree twenty-five feet in height was erected in the centre of the large music hall, which was illuminated by 220 two candle-power electric lamps, the electricity being supplied by a dynamo run by water-power in the basement of the building. The tree was loaded down with gifts of all kinds and gaily decorated, while on all sides were heaps of good things intended as presents to every family, including the children, in the employ of Mr. Coleman around Cornwall.

At Harrisburg, to-day, an application was filed at the State Department for a charter for the Washington Electric Company of Pittsburgh, which will make and deal in electric machinery; capital, $1,000,000. The list of incorporators is headed by Mr. Westinghouse, who is the inventor of the air-brake which bears his name. They are all Pittsburghers. Mr. Westinghouse obtains 18,000 of the 20,000 shares at $50 each in return for the conveyance to the company of a number of patents relating to electricity and a number of inventions for which patents have not yet been obtained. E. F. I.

WESTERN NOTES.

BRANCH OFFICE OF THE ELECTRICAL WORLD,
CHICAGO, Dec. 28, 1885.

In my last letter I called attention to the very material progress made in electric lighting during 1885 in the West. Reference is made below briefly to the advancement made during the same period of the electrical business generally in this territory.

Comparison being made in each case with 1884, the business done during 1885 by the general electrical supply companies does not show, probably, so large a percentage of increase over the previous year as does the electric lighting business. This does not argue, by any means, that the business has not shown substantial advancement, for such is not the case. It merely goes to show that electric lighting, especially the incandescent branch, has experienced a sort of a boomlet during the past twelve months in the West.

Material and substantial progress has been made during 1885 by the general electrical supply companies who were in business here at the commencement of the year. Besides this, an electrical supply house, strong in the East, has established a branch here, which is now firmly on its feet, and in splendid shape for business next year. One or two companies, which were weak financially twelve months ago, have now an established credit, a good trade, more workmen, and better quarters than they had at the beginning of the year. The old houses do not seem to have suffered through the prosperity of their younger competitors. The increase in the demand and general expansion of the business seem to have made the new depots of supplies necessary. One brand new company, manufacturing a specialty, has also been organized, and is doing a business which seems likely to assume very large proportions. The supply companies have, of course, benefited to quite an extent by the increase in the electric lighting business noted. New and larger quarters have been secured by an electro-medical company, and I think we have in the West now the strongest and largest medical apparatus furnishing establishment in the world. Two new electric steam engine governors have been brought out during the year, and their respective companies are pushing them with characteristic Western energy. Surrounding cities have shared in the general prosperity; Milwaukee has a new company; St. Louis has a new company, manufacturing an electrical specialty; and Detroit's electrical supply house is away ahead of its 1884 mark.

The past year has also seen the establishment of a Western branch office of THE ELECTRICAL WORLD, which is as fully equipped in proportion to its needs as the home office. The success of this office has confirmed the judgment of the publisher, as regards the volume of business being done in the West, in its establishment. It has also shown the different companies that the paper is at all times looking closely after their interests, and that in doing so no question of expense is allowed to stand in the way.

Omaha and Salt Lake City have new supply houses also.

Taking everything into consideration, the year 1885 was a very satisfactory one indeed for the electrical business as a whole. W. A. K.

THE TELEGRAPH.

Philadelphia Wires.—At the last minute, the City Councils have resolved not to begin wire-cutting on Jan. 1, but to "confer" with the companies interested.

Western Union Taxes.—The Western Union Company has not paid its "capital stock" taxes yet, and meantime the sheriff has been served with a notice to the effect that part of property levied on belongs to the Western Electric Company.

A Mortgage Filed.—A dispatch from Ellicott City, Md., dated Dec. 22, says: A mortgage has been left at the Clerk's office here for record from the United Lines Telegraph Company to the Farmers' Loan and Trust Company of New York, to secure an indebtedness of $1,200,000 to various persons, the said telegraph company having issued 1,200 one thousand dollar bonds, payable on the 1st day of July, 1905.

Another Telegraph Company.—The Consolidated Telegraph and Electrical Subway Company has filed articles of incorporation in the County Clerk's office in this city. The capital is $10,000; the object, to establish lines of telegraph to cities in the State, with underground wires when necessary. The incorporators are Ewald Balthasar, Henry Fitz Hugh, Henry J. Davidson, James B. Houston and Frank L. Freeman.

Burglarious Messengers.—Three district messengers have lately been utilizing for burglarious purposes their knowledge of houses they have been sent to. Fully a dozen flat-houses on the west side of New York have been visited by them, but the robberies have now attracted attention, and the boys are likely to find that there is a punishment fitting their crime. They are now in the hands of the police. It deserves mention that the robberies were committed after the boys had left the messenger service, and they seem only to have entered it for the sake of finding out how to steal most easily from houses.

The Way the Wind Blows.—A director of the Western Union Telegraph Company last summer said, with an oracular air and prophetic positiveness: "As certainly as Congress meets you will see a bill introduced to buy Western Union's plant." About a fortnight ago Cyrus W. Field suggested that the Government ought to buy the wires of all companies which had for a year past paid five per cent. dividends, and that it could do so by issuing three per cent. bonds to pay for the plants. Senator Cullom's bill, brought forward a few days ago in Washington, proposes to buy all such telegraph lines as have paid five per cent. with bonds issued at three per cent. The Western Union is the only company which has paid any such profit in the last twelve months. Therefore Senator Cullom's bill is to buy Western Union's plant and fulfill the Western Union director's prophecy.

A New Telegraphic Scheme.—It is reported from Washington that William F. G. Shanks, of this city, has arranged with Senator Conger, of Michigan, for an early hearing for his new telegraph scheme. Mr. Shanks says that a company with a capital of $5,000,000 is being formed, including New York and San Francisco capitalists and journalists, and that the company controls all the patents for the wires and machinery for this country and England. The company promises to build wires to San Francisco within the next two years capable of accommodating the entire commercial correspondence between the two coasts, including English and Australian communications, practically shortening mail communication with the East and West by seven days' time at a cost of not more than half a cent per word. The lowest present rates between San Francisco and New York are seven and a third cents per word. The preparation of dispatches for rapid transmission is much simplified by new machinery.

The New West Indian Cable.—Most of our readers will hail with pleasure, says the Kingston *Gleaner*, Jamaica, West Indies, the announcement that Her Majesty's Government has advertised for bids to lay a cable between Halifax, Bermuda and Jamaica, because when that is done the monopoly enjoyed by the W. I. and Pacific Telegraph Company will be at an end; the principal reason advanced for the payment of the £2,000 subsidy will no longer be tenable, and it is within the range of possibility that the company may be induced to send messages at a reasonable rate. But the announcement, we take it, means that Jamaica has been decided on as the headquarters of the military for the West Indies, which is a step in the right direction, and in keeping with the importance of the colony. On the completion of the Panama Canal, Jamaica will hold the same relative position to that canal that Malta holds to the Suez Canal, and will be a place of great importance to the British Empire. There was also a talk some time since of utilizing the whole of Port Royal as a naval station, where extensive repair shops and a dock were to be constructed, and it may be that the present movement is a step in that direction. However that may be, a new cable to this island will be a great acquisition, and supply a want long felt.

THE TELEPHONE.

A Month's Output of Telephones.—A dispatch from Boston says that the Bell Telephone Company's statement of the output of instruments for the month ended December 20th shows: Gross output, 3.069, against 2,206 in the previous month; returned, 1,472, against 1,827; net output, 1,597, against 379.

The Newark Litigation.—Argument has again been heard by Vice-Chancellor Bird in the suit of the Domestic Telephone Company of Newark, N. J., against the New York and New Jersey Company and the Metropolitan Company. It was stated that the offer of $150,000 was refused by the Domestic Company.

Drawbaugh's Appeal.—Members of the Drawbaugh syndicate met in Boston on the 25th of December last, having delayed meeting until Hon. Frank Jones returned from Europe, and considered a communication from Senator Edmunds, recommending an appeal from the decision of Judge Wallace in the Bell-Drawbaugh suit to the United States Supreme Court. It was voted to make the appeal prior to Jan. 1, and the expectation is that the Attorney General will see that the case be placed upon the calendar so as to insure a hearing this winter. The Drawbaugh people take no part in the proceedings to test the chief patent of the Bell Company, now before Secretary Lamar. The Drawbaugh issue, they say, is one of priority of invention and not of infringement, and it is of no concern to them whether Bell or Gray should have acquired a patent if it shall appear that Drawbaugh was the earliest inventor of the telephone.

Is Suit to be Brought?—The New York *Sun* has the following Washington special: Secretary Lamar's decision in the Bell telephone case will not be made public until after the return of the commissioner of patents, who has gone to Michigan for the holidays. Assistant Secretary Jenks is preparing the decision very carefully, and he will include in it an exhaustive statement of the reasons on which the secretary's action is based. What the tenor of the decision will be can be stated on good authority. The secretary will recommend that the attorney general authorize suit to be brought in the name of the United States to test the validity of Bell's original patent. Among other things, the decision will set forth that the specification of Bell's patent contains nothing about the capability of Bell's instrument to transmit articulate speech, but only claims for it the power to transmit "vocal sounds;" that an instrument may transmit "vocal sounds" without being a speaking telephone; and that, in point of fact, Bell did not invent a speaking telephone until after the issue of his patent, as appears from the record. For these reasons, it will be urged, the validity of the Bell patent is fairly questionable.

New England Telephone Stockholders Aroused.—A stockholder of the New England Telephone Company writes to the Boston *Herald* as follows: "The meeting of the directors of the New England Telephone Company yesterday, and their adjournment without consideration of the long-wished-for dividend, strongly corroborates the expressed opinion that the only means by which a dividend will ever be procured is by a combined movement on the part of the stockholders demanding from the Bell Company the payment of dividends as they are earned. Many stockholders, myself among the number, do not expect the Bell Company to waive the right to a dividend on the franchise stock, although there are numbers who think it exorbitantly large. The most conservative opinion has been that the Bell Company were not justified in their refusal to allow dividends to be paid, and especially at the present time. It does seem that the Bell Company fear too large an income, for the latter is now so large as to make it undesirable to increase it from this and similar sources. But should the stockholders of the weaker corporation suffer because of the prosperity of the larger, or because the latter fears adverse legislation on account of increased net earnings? Were it to treat the New England stockholders fairly, all efforts aimed at them in the Legislature would lack the moral and active support of those now inclined to strongly indorse those efforts. The cry then would be, 'Let well enough alone,' and see what the future will bring forth. If nothing is done right early looking to the payment of dividends due them, it would not be at all strange should a strong, determined and concerted movement be made by those who, seeing their property reduced in value two-thirds, are quite willing to spend the other one-third to get what all but the Bell Telephone Company consider their rights."

THE ELECTRIC LIGHT.

Raleigh, N. C.—The capital stock of the Thomson-Houston Electric Company, of Raleigh, N. C., is $32,000.

Kansas City, Mo.—The various accounts coming to hand from Kansas City, Mo., since the destruction of the gas works there, show that the electric light company is pushed to its utmost capacity, and that both kinds of electric lighting are in great demand. Many new contracts are being signed.

Electric Light Carbons.—Speaking about the rapid growth of their business, Mr. J. Perry Lucas, Secretary of the Forest City Carbon Company, says: "Mr. Devitt and I have worked and experimented year for a number of years on carbon, and just one ago we had that which we wanted. We formed our company, which is composed of young men. Our goods were first placed on the market February 5th, 1885. This may be called rapid and shrewd business advance. Our capacity at present is 150,000 carbons per week, and we are constantly increasing our facilities to meet the increasing demand. We contemplate building an adjoining extension 50 × 300 feet, and to have it ready for use by March 1." There is a wonderful growth exhibited in this brief and modest statement.

PERSONALS.

Mayor O'Brien, of Boston, has been re-elected. This gentleman is the treasurer of the local Brush Electric Light Company, and appears to have the knack of making himself popular in more capacities than one.

Mr. H. M. Cleveland.—We learn that Mr. Cleveland resigns the presidency of the Schuyler Electric Light Company, his resignation to take effect from Jan. 1, 1886. It is understood, however, that Mr. Cleveland expects to remain in the business, and no doubt, as he is open to form new connections, his services will soon be required.

President D. H. Bates, of the Baltimore & Ohio Telegraph Company, received a Christmas present from the managers, superintendents and chief operators in the shape of a magnificent album containing their photographs to the number of 1,000. In his neat acknowledgment, Mr. Bates said: "To be at the head of such a staff is worth more than any other compliment or reward."

Poor Mr. Pender.—Six men were convicted at Kirkwall, in the Orkneys, on Dec. 22, for rioting and assaulting Mr. John Pender, the late member of Parliament for the northern burghs, and their conviction caused great excitement at Kirkwall. This goes far toward verifying what Mr. Labouchère says in *Truth* about Mr. Pender: "Things are going badly with John Pender, M. P.—I beg his pardon—ex-M. P. Not only do 14 telegraph and other companies mourn the loss of those two magic letters after the name of their chairman or director, but the establishment of a Russian telegraph office on the Afghan frontier foreshadows the connection of a direct overland line from Europe with the Indian telegraph system, and, consequently, a serious competition for the Eastern Telegraph Company."

Mr. J. M. Orford, Superintendent of the Bridgeport Electric Light Company, was informed on the 24th inst. that the employés of the electric light station had been up to his house and left something for him. He went home to

see about it, and to his amazement and delight found an elegant rocking chair. His fellow employés had "chipped in," all around and raised a purse of $20. They took this and purchased the beautiful chair, and sent it to Mr. Orford's house as a Christmas gift and expression of their friendship and esteem. He naturally prizes it very highly. Mr. Orford, by the way, has knocked around the world a good deal. He was once an inspector of telegraphs under the East Indian Government, and has shaken hands with "chefs" in St. Petersburg, Berlin, Copenhagen, the Hague, Teheran and Constantinople. He is now making a success of the electric light in Bridgeport.

Mr. Charles A. Randall, the well-known electrician and telephonist, had a narrów escape in the accident on the 27th inst., on the New Haven Railroad. He had been asleep in the car that followed the Mann boudoir car. He came to his senses to find himself bouncing along on the sleepers. In great affright he jumped for his window and smashed it. As he did so the car toppled over, falling on the side opposite to that on which the window was. He climbed out of the window without waiting to take anything with him, and jumped a couple of feet to the ground. He had nothing on but his undershirt. "I tumbled nearly half way down the embankment," he says, "clutching at the earth as I went in the effort to stop myself. Below me I could see the fire and steam of the engine, and above the cars seemed about to topple over on me. Half way down I managed to stop myself, and, keeping out of range of the cars, started to climb back. I was nearly frozen, but was at first afraid to go near the car. Finally I reached in the window and pulled out a blanket and wrapped it around me. A little later I reached in the window again and got some of my clothes and partly dressed myself. Then three or four men came along and took me up into one of the cars that was standing. In the course of half an hour or so they brought me some more of my clothes, but I lost my overcoat."

APPLICATIONS OF POWER.

Detroit Men Inspecting.—Mayor Chamberlain, Mr. C. G. Moran, County Auditor, Mr. A. Gobel, President of the City Council, and other officials of Detroit, paid this city a visit last week and inspected the Daft and Edison systems of electric locomotion with a view to the adoption of electricity on a railway on Belle Isle, the principal park of Detroit. The road will be several miles in length.

MISCELLANEOUS NOTES.

A Living Battery.—Frank Burnett, aged fifteen, residing with his widowed mother at Youngstown, O., is said to have developed powers indicating that he is an animated electric battery. He is slightly built, and on his approach chairs and tables dance and heavy articles totter that his natural strength could not move. The lad is unable to explain his unnatural power, and has always enjoyed good health. The tests made thus far show the lad to be able to do more than he has claimed. It is probable medical experts will examine him to ascertain, if possible, the secret of his power.

SPARKS AND FLASHES.

"On Tick."—There are 1,000,000 men who live "on tick" in this country, not including 50,000 telegraph operators.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations on the New York Stock Exchange, Boston Exchange and elsewhere are as follows:

Telegraph.—Am. Dist., a 32¼; B. & M., b 3, a 4; Western Union, b 72½, a 72¾.

Telephone.—Am. Bell, b 172, a 173; Erie, a 30½; New England, b 32, a 32½.

Electric Light.—No new quotations.

BUSINESS NOTICES.

[Copy.]

W. H. GESNER, SUP'T.

OFFICE OF
THE BRUSH ELECTRIC LIGHT AND POWER CO.,
MONTGOMERY, Ala., Nov. 17, 1885.

Messrs. Giles, Bro. & Co., State and Washington Streets, Chicago, Ill.

DEAR SIRS: I have to acknowledge receipt of my watch with magnetic shield. Please accept my thanks.

I have given the watch a thorough test—held it all about the field magnets of a No. 8 Brush machine, running at 750 rev. per minute and supplying 52 arc lamps, without visible effect.

I consider your magnetic shield a perfect protection from magnetism.

I have ruined three or four watches heretofore, and have spent money enough for repairs to buy a dozen shields almost.

Very truly yours,
W. H. GESNER, Sup't.

Glenn's Sulphur Soap
Heals and beautifies, removes pimples and blemishes; 25c.
GERMAN CORN REMOVER kills corns and bunions; 25c.
HILL'S HAIR AND WHISKER DYE, black and brown; 50c.
PIKE'S TOOTHACHE DROPS will cure in one minute; 25c.
DEAN'S RHEUMATIC PILLS are a prompt, sure cure; 50c.
HALE'S HONEY, the great cough cure, 25c., 50c. and $1.

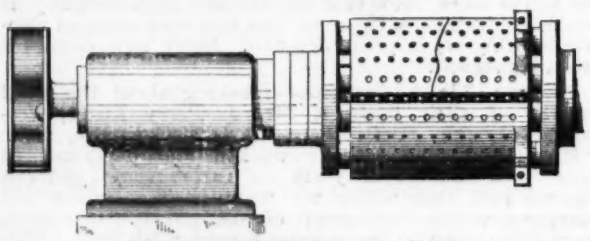
OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

PATENTS DATED DECEMBER 15, 1885.

332,254. Electric Mat; Harvey H. Hoffman, New York, N. Y. It is adapted to give a signal when stepped upon, and consists of suitable spring pieces in open circuit that are pressed together to complete a circuit by any person walking thereon.

332,286. Electric Safety Fuse; Gustav Pfannkuche, Hartford, Conn., assignor to the Schuyler Electric Light Co., of same place. The construction is shown in the illustration, while the object is to automatically cut out the circuit from translating devices when the current becomes accidentally too great.

332,319. Electric Conduit; John A. Barrett, Brooklyn, N. Y. The working chamber is illustrated in the cut, while the invention consists of a main-line conduit, two closed coupling-boxes (with removable caps) interposed in said conduit, a transfer-pipe uniting the coupling-boxes, and electrical conductors passing through said conduit, coupling-boxes, and transfer-pipe to render the conductors easy of manipulation, while protecting them from unauthorized interference.



332,427. VENTILATING DEVICE FOR COMMUTATORS OF DYNAMO ELECTRIC MACHINE.

332,336. Signaling Device; John D. Fee, Chicago, Ill. It is designed to take the place of the ordinary bell rope in railway cars, and consists of an open circuit and circuit closers placed in the several cars and especial combination of automatic circuit closers.

332,383. Lightning-Rod Standard; James W. Cole and Henry Knudsen, Greencastle, Ind., said Knudsen assignor to said Cole. Consists of telescopic joint and triangle whereby the rod may be extended to an indefinite height.

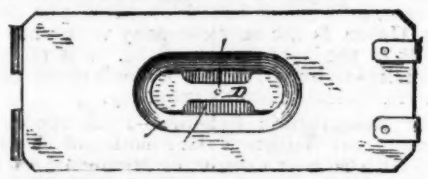
332,388. Magneto Electric Call-Bell; Harry T. O. Frazer, Clerkwell, England. Instead of employing two separate magnets he utilizes the compound magnet of the generator to polarize the electro-magnet of the ringer; and to obviate the wearing of journals by friction or band wheels he uses toothed wheels, and overcomes the objection to toothed wheels—viz., the noise made by running them in a hollow case—by employing universal compound journals, while the main toothed driving-wheel also operates the cut-out.

332,399. Dynamo Commutator; Charles D. Jenney, Indianapolis, Ind. Consists of a commutator in which the conducting parts are slotted, an armature the ends of the wires of which lead to and enter said slots, and a non-conducting covering wound over the outside of said ends of wires.

332,419. Perforating Machine; James E. Morrison, New York, N. Y., consists of numerous details of construction of a device for carrying out a method of automatically operating a type-setting machine by means of perforations in a strip or band of paper, said band being so moved that its perforations are brought within the range of action of the type-selecting devices, the position of said perforations upon the band and with relation to each other indicating the types to be selected, and causing the devices to make the proper selection.

332,420. Automatic Circuit Closer and Breaker; M. Jervis Meyers, Syracuse, N. Y. Its use is for gas lighters, and consists of an electro-magnet and pivoted armature, a pivoted lever actuated by said armature and arranged to transmit motion to the circuit breaker, and a weight arranged to be movable on said lever from end to end thereof, and thereby impart to said lever the power for actuating the circuit breaker.

332,427. Ventilating Device for Dynamo Commutators; Charles Parham, Philadelphia, Pa. As shown in the cut, the suction-wheel at the left draws in and forces through air, the holes of exit being at the commutator shown at the right of the figure.



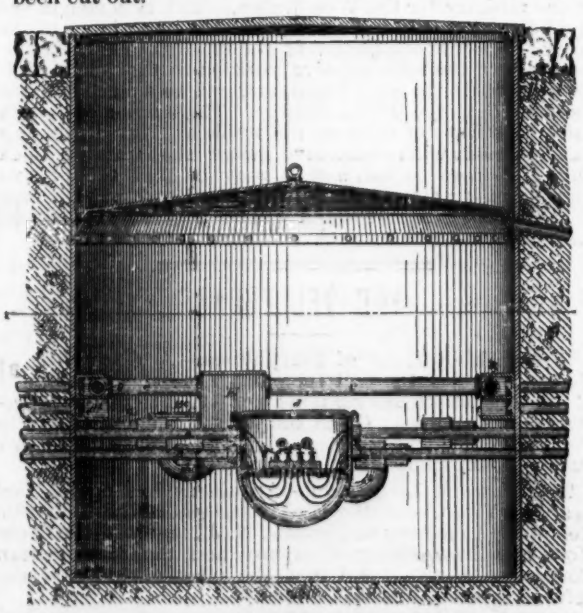
332,286. ELECTRIC SAFETY FUSE.

332,431. Railway Signal; William M. Pease, Pittsburgh, Pa., Assignor of one-half to Lenox Simpson, same place. The object is to provide means whereby each moving train may at short intervals automatically report to the main office its position upon the road. Consists of a combination of levers and magnets whereby the train serves to operate switches and give signal at main station.

332,453. Electric Light Attachment for Speculums; Castle Smith, London, England. Consists of a lamp-holder, a plate to which said lamp-holder is pivoted, and which is furnished with insulated terminals, and a fastening to which the said plate is hinged, and by which it may be attached to the instrument.

332,467. Electrical Therapeutical Belt; Charles N. West, San Francisco, Cal. Consists in a construction by which the elements may be taken apart at pleasure and any of its parts exposed, so that they may be cleaned or renewed without breaking the electrical connection between these elements or in any manner require the reconstruction of any portion of the battery or elements in the series constituting the belt.

332,480. Electrical Indicator; Jeffrey C. Boyle, Brooklyn, N. Y. He provides a permanent magnet to retain the index hand after the operating electro-magnet has been cut out.

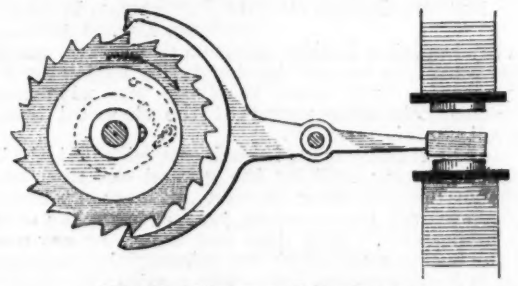


332,319. CONDUIT FOR SUBTERRANEAN ELECTRICAL CONDUCTORS.

332,547, 332,550, 332,551. Quadruplex Telegraph; Henry C. Nicholson, Mount Washington, Ohio. Assignor to the Western Union Telegraph Company, New York, N. Y. 1. Consists, first, of the combination, at one station, of two electrically connected keys, one of which when operated reverses the polarity of the line-current controlled by the other; and secondly, of various combinations of a relay and two local circuits with appropriate sounders, so constructed and connected that a line-current of ordinary tension will operate only the one or the other of the sounders, according to the polarity of the current, while both sounders will respond to a line-current of increased tension. 2. Consists in a derived invention upon his patent of March 21, 1871, No. 112,836. 3. Consists of two unequal main-line batteries normally out of circuit and two transmitting-keys, one of which, besides independently controlling one of the batteries, also controls the connections of the contact-points of the other key in such a manner as to determine the polarity of the current from the battery put to line by the latter.

332,559. Induction Coil; James A. Robinson, Nashville, Tenn. Consists of an induction-coil having a tubular core internally screw-threaded at one end and of a detachable head and a tubular screw passed through the head and screwed into the end of the core.

333,567. Individual Call; Johnston Stephen, Edinburgh, Scotland. Consists of an electric circuit, a current-reversing device at a calling-station, and an electro-magnet in said circuit, a magnet and a pendulum, all at a receiving-station, said magnets being fixed, one to the pendulum and the other to a support stationary relatively to said pendulum.



332,649. PRINTING TELEGRAPH.

332,638. Electric Fire Alarm; Sidney A. Chase, Evart, Mich., Assignor of one-half to William R. Mapes, same place. Consists in such an apparatus that the breaking of the main-line circuit, which is preferably accomplished by means of a common telegraph key, operates by the one movement both the alarm-releasing instrument in a normally-closed local circuit and a local alarm-bell placed in a normally-open local circuit.

332,649. Printing Telegraph; Richard N. Dyer, New York, N. Y., Assignor to the Commercial Telegram Co., of same place. He employs a single scape-wheel and pallet, as shown in the cut, the latter connected directly with the magnet-armature and vibrated thereby. The scape-wheel is not connected rigidly to either type-wheel shaft, but is coupled with them by pawls and ratchets. The scape-wheel is turned by both shafts when both type-wheels are revolving; but when one type-wheel is stopped at its blank space or unison, the shaft of the other type-wheel turns the scape-wheel alone, the pawl-and-ratchet connections permitting this to be done.

332,673. Coupling for Lightning-Rods; Alvin J. Monson, Indianapolis, Ind. Each rod-section is braced by the four quadrants, but bolted only to two quadrants, and the bolts of each section are at right-angles, to brace the jointing.

332,685. Dynamo-Electric Machine; Frank G. Waterhouse, Sacramento City, Cal. Consists of two separate field-magnets, each provided with two separate pole-pieces, a rotary armature and commutator and connections, the poles of the armature being arranged adjacent to the opposite poles of the two field-magnets, whereby the said armature-poles act inductively upon the adjacent poles of the field-magnets, and strengthen the poles at the opposite end of the magnets.

332,688. Electric Motor; William Main, Brooklyn, N. Y. Consists of a revolving armature consisting of a core having polar projections, stationary pole-pieces arranged on opposite sides of the armature to receive the magnetic reaction of said polar projections as the latter alternately approach and recede with the rotation of the armature, and a stationary exciting-coil surrounding said core and arranged with its axis coincident with the axis rotation of said armature, whereby the armature is caused to revolve within its exciting-coil.